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The AIRCRAFT ENGINEER AND AIRSHIPS

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Bravo, Air France!

THAT a letter despatched from Paris on a Sunday should be delivered in Santiago de Chili, over 9,300 miles away, on the following Wednesday is certainly a milestone in the progress of air transport. It is a great demonstration of the speed of aircraft over a long distance. In particular, what is so very satisfactory about the schedule is that there is no mention of air speed; journey speed alone is taken into account. Because the reckoning is in days and not in miles per hour, the figures look a little less impressive if one starts the journey at Croydon on a Saturday. Paris is the real starting point of the line.

It will, however, be a great convenience to very many British business men to be able to despatch a letter from London on a Saturday with the knowledge that it will go to Buenos Aires on the next Tuesday, that the reply will be able to leave that city on the Sunday, and will reach Croydon on the morning of Thursday. Four clear days will be given to the parties in Buenos Aires to consider the letter and draft the reply, and yet that reply will be received in less than a fortnight. The probability is that the bulk of the mails carried will be between business men in Britain and the Argentine, and both will be under a debt of gratitude to Air France.

From the technical point of view it is remarkable that Air France possesses five aircraft, representing four different types, which can be used on the crossing of the South Atlantic between Dakar and Natal. There are two four-engined Latécoère flying boats, the *Croix du Sud* and the *Ville de Buenos Aires*; one four-engined Blériot boat, the *Santos-Dumont*; a four-engined Farman landplane, the *Centaure*; and a three-engined Couzinet landplane, the now famous *Arc-en-Ciel*. A heterogeneous fleet is not convenient for regular commercial operation, but it is extremely creditable to French designers that four designs should be capable of making an ocean crossing of 2,300 miles. In due course some standard type will doubtless be chosen for the mail work. Passenger traffic is to be undertaken later, but it appears that Air France does not intend to delay the mails for the convenience of the passengers. Only on the ocean crossing will they be amalgamated in the same machine. On the Paris-Dakar and Natal-Santiago stages the mails will go by fast machines and the passengers by slower and more comfortable aircraft. That, *Flight* has consistently maintained, is the ideal way of operating an air service. It remains to be seen whether the balance sheet will justify this way of operating. It would scarcely be possible without Government support on a scale which the British Government would consider extravagant. The French Government may take the view that even a large subsidy is money well spent if they can secure the bulk of British mails to South America in addition to their own mails.

Culmination

This triumph of Air France is all the more creditable because it is the culminating point of a long period of effort, and perhaps this culminating point would never have been reached but for the merging of all French air lines into the one company known as Air France. The land sections, Paris-Dakar and Natal-Santiago, were first laid out as air lines and thoroughly tested. One speaks lightly of the Natal-Santiago section, but it involves crossing the Andes, the second highest mountain range in the world. The Paris-Dakar section, too, has its own difficulties, and there have been tragedies of pilots captured by the Riffs and tortured, sometimes put to death. Some seven years ago the ocean section was crossed by fast despatch boats, which gave a service of ten days between termini. Then air bases were made on Cape Verde Island, three hundred miles from Dakar, and on Fernando de Noronha, two hundred miles from Natal, and then the service was reduced to seven days.

In May, 1930, Jean Mermoz made the first test flight across the South Atlantic in a single-engined Latécoère flying boat. Then a number of suitable multi-engined aircraft were produced, and by now fifty-seven experimental mail-carrying crossings have been made. For some time past the mails have gone by aircraft and

steamer on alternate weeks. Now the mail service is to go by air every week, flying by night as well as day. When the Loire 102 flying boat comes into service she will have sleeping bunks for passengers.

When this South Atlantic service is well established, announces Air France, the Company intends to turn its attention to the North Atlantic.

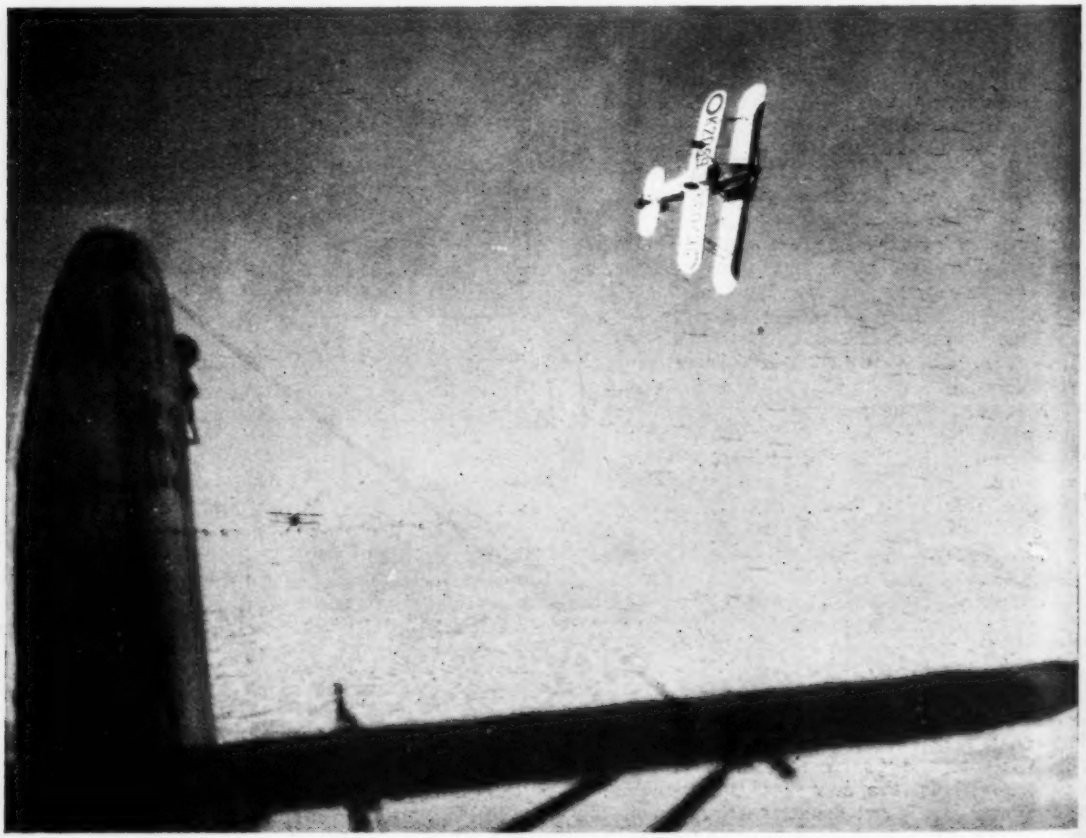
Commercial Efficiency

EFFICIENCY, in mechanics, is the ratio between that which is put into a machine and that which is taken out of it. The efficiency of aircraft can be of various kinds, not always conforming too well to the strict definition of the word. Thus the aerodynamic efficiency can be regarded as the ratio of lift to drag, the structural efficiency as the ratio of gross weight to tare weight, and so on.

The commercial efficiency of aircraft is a quantity difficult to define concisely. Yet it is one which the operator needs to know in order to select the type of aircraft which best suits his requirements. Unfortunately, any given aircraft may be very efficient for one kind of route and very inefficient for another, so that before efficiency can be assessed it is necessary to make all sorts of provisos.

In this week's issue of *Flight* a contributor attempts to give a "figure of merit" intended to serve as a guide to operators in judging the relative "commercial efficiency" of different aircraft. The factors which enter into his formula are the speed, the horse-power, the number of passengers, and the price. With this choice of factors few will probably disagree. They are the items which most affect what the Germans call the "payability" of an aircraft. Obviously, the faster a machine is for a given number of passengers and a given horse-power, the more efficient it is; and the less it costs per passenger seat, the more economic it should be. Or, conversely, the smaller the horse-power for which a given number of passengers can be carried at a given speed, the greater the economy of operation.

However, it does not seem by any means certain that our contributor has necessarily chosen the correct exponents for the different factors. For instance, drag or resistance varies as the square of the speed, and horse-power varies as the cube of the speed. Fundamentally, therefore, one would expect the exponents of these two quantities to be something other than one. By choosing an exponent larger or smaller than one, greater or less weight would be placed on the particular item, which might be speed, or cost or horse-power. But perhaps our contributor assumes that operators are a little weak on powers and roots, and therefore prefers to use the plain figures. At least the formula has the merit of simplicity.



A SERVICE RECORD: Figures recently issued by the Air Ministry show that the flying-time of the machines engaged in the 1935 Air Exercises aggregated 3,839½ hours, which is an increase of 37 per cent. over the figures for 1934. High-altitude fighting was an outstanding feature, combats between light bombers and fighters being fought at about 21,000 ft. This photograph, taken during the Exercises, shows such an engagement. The fighters are Furies and the picture was secured from a Gordon.

The Outlook

A Running Commentary on Air Topics

Blind Flying First

DURING the past year or so, since instrument flying has become part of the curriculum of all the more important clubs and schools, enquiries have revealed the fact that the pilot with a comparatively small flying experience usually learns to fly by instruments in a shorter time than that taken by the old hand.

So it was that a contributor suggested in *Flight* of October 17th that a person who had never flown at all might logically be expected to master the technique in an even shorter time. In this week's issue the chief instructor of the Royal Danish Naval Air Service School enlarges on his experiences at the only training school in the world, so far as we know, where the *ab initio* pilot, after a few hours of passenger flying, is given all his preliminary training under the hood. His remarks are, to say the least of it, extremely interesting, and the method opens up a complete vista of possibilities.

Training for Transport Work

WHILE amateur and Service pilots will continue to find that horizon-flying methods are the most useful, the transport pilot will find, year by year, that his instrument-flying ability is his most important one. Furthermore, when approaching or landing in conditions of zero visibility, his attention will necessarily be divided between his blind-flying instruments and his radio-approach dials. His reactions to the instruments must be just as automatic as they are when he has an outer world by which to fly.

We suggest, therefore, that, if and when the majority of transport pilots are actually trained *ab initio* for commercial work, the obvious course would be to place them under the hood at the very start of their flying life. Then the world will see a new generation of pilots who are completely fitted to face the particular problems of day-in and day-out air-line operation. To-morrow the transport pilot will be an "instrumental scientist" rather than a mere pilot.

That Third Control

INVENTORS continue to worry their brains with the problem of reducing to two the number of flying controls which the beginner has to operate when learning to handle an aeroplane. M. Mignet takes the bull by the horns in his *Pou* and omits the ailerons altogether. There are, however, times when direct lateral control is desirable, particularly during take-off and landing; and in any case ailerons cannot safely be omitted in machines of large span and high efficiency.

In this issue will be found a description of a system of automatic stability invented by an Argentine engineer resident in France. The Bemberg system, as it is called, is admittedly somewhat crude in its present form, but there does not appear to be any reason for thinking that it cannot be improved, and already the experimental control has been declared by pilots to work very well on a Moth.

Briefly explained, the system involves connecting two special "kites" to a system of crank levers in such a way that differential operation, very similar in general principle to the familiar differential aileron control, results from a lateral tilt of the machine.

The main objection to the system appears to be that as the "kites" always fly at the same angle of incidence, whatever the aeroplane itself is doing, their lift, and consequently the force exerted on the lateral control, varies as the square of the air speed. That obviously means that at top speed or cruising speed the force required on the joy stick, if the pilot wishes to overcome the automatic control, is likely to be considerable. On the other hand, it is usually during a landing that manual control may be desired, such as for a sideslip, and the force exerted by the "kites" is then a good deal smaller. However, the Bemberg system is an interesting experiment, and may lead to something practical.

"Double" Engines

A REPORT from France that the Hispano company is working on an engine group or pair of 2,000 h.p. is of great interest at the present time, when the tendency is all towards the twin-engined and very large four-engined machine. It is said that the Latécoère company is designing a flying boat of 80 metric tons weight (176,000 lb.), and that the French air ministry is offering a large prize for the best solution of the problem of engine groups. It is believed that the Hispano project includes two type 12 Y engines placed end to end and driving co-axial airscrews running in opposite directions. Presumably the drive will be arranged somewhat like that of the Fiat Schneider engine group.

In its last annual report (reviewed in *Flight* of November 14, 1935) the Aeronautical Research Committee stated that British technicians had come to the conclusion that there was no mechanical impossibility in building a 200-ton flying boat, but that the effect of six or eight airscrews along the leading edge required investigation, and also the mechanical details of putting something like 5,000 h.p. into a single shaft.

Apparently the French *Service Technique* has realised the importance of these problems and is doing something to get them solved straight away. It may perhaps be recollected that at one of the first Paris aero shows after the war, Louis Breguet exhibited a four-engine group, known as the Breguet-Bugatti. At the time there was probably little need for such a group, as there were no aircraft into which it could usefully be installed. Nowadays, however, conditions have changed and the problem of co-axial airscrews running in opposite directions seems to merit careful study. There is no immediate use for groups in which 5,000 h.p. have to be put into a single shaft, but there are several applications, civil and military, of power groups or pairs of 2,000 h.p. or so.

Tapered Wings

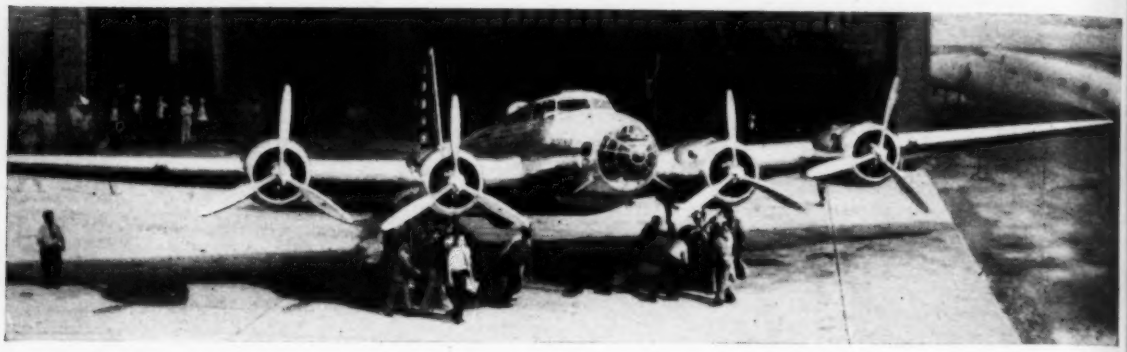
LAST week attention was called, on this page, to Dr. Lachmann's article on the stalling of tapered wings, and the view was expressed that tapered wings might not be quite as black as Dr. Lachmann had painted them. Agreement with this view is expressed in an article, received just as we are about to go to press with this week's issue of *Flight*, by Mr. W. R. Andrews, of the Avro technical staff.

Mr. Andrews' article, which we shall be publishing shortly, is a defence of the tapered wing in so far as it points out that Dr. Lachmann's argument must be based upon a tapered wing having the same aerofoil section along its span, or, in other words, a wing having constant thickness-chord ratio. By adopting the more usual procedure of employing a straight taper, the aerofoil section changes from root to tip, and Mr. Andrews claims that it is then possible to obtain stalling at the centre first and at the tips afterwards, as in a rectangular wing.

THE BIG BOMBER TO-DAY

Its Relation to Civil Types : New Foreign Designs Reviewed : Larger and Heavier Types Imminent

By H. F. KING

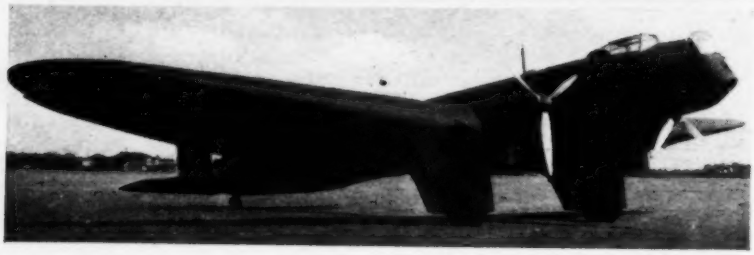


The experimental Boeing 299 (four Pratt and Whitney Hornets), which, entered in competition with a new Martin and Douglas, was destroyed in a crash—through no fault of its own—some weeks back. It is said that the crash was caused through the pilots taking off with locked controls. According to one report the 299 has been adopted by the U.S. Army Air Corps.

THE potentialities of the large commercial aeroplane have been the subject of more than one discussion in *Flight*. While it is generally agreed in technical circles that its qualities for possible military use have been overestimated by certain organs of the lay Press it is conceded that the great advances made during recent years in the design of high-speed commercial aircraft have had a pronounced effect on the development of contemporary bombing types. The performance of the bomber, in fact, has advanced to such a stage that the design of fighters has been affected and further radical changes in tactics and equipment seem inevitable.

In converting a large passenger machine into a bomber it will be found, in all probability, that the design of the fuselage is the greatest bar to efficiency. To cut bomb traps and gun positions in a modern commercial aeroplane is no light task, particularly if the type concerned has stressed-skin covering. What is more, the fuselage is likely to be unnecessarily large.

It does seem possible, however, that a nation desirous of employing its air liners as bombers in time of war could standardise a certain set of wings and power plant installation, and provide quickly interchangeable fuselages, one for civil and the other for military duty. The resulting bomber should prove at least considerably more efficient than would be the case had it a modified civil-type fuselage. Admittedly, a study of up-to-date low-wing monoplane bombers indicates that some form of "belly" may be desirable for the internally stowed bombs, if the utmost efficiency in lay-out is to be attained, and it might not be possible to embody this during the conversion.



These two British machines are the subject of large Air Ministry contracts : they are (top) the Handley Page Heyford and (below) the Fairey Hendon. Both types, as at present being built, mount the 600-h.p. Rolls-Royce Kestrel VI, which is supercharged to give that power at 11,000 ft.

Passing over British practice for the moment, and turning first to America, it is found that there the development of the large, high-speed bomber has been concurrent with that of her fast transport monoplanes which have demonstrated such excellent performances. The employment of such aids as retractable undercarriages, C.P. airscrews, low-drag cowlings, carefully designed wing-root fillets, the efficient placing of power plants in relation to the wing, and the use of fuels of high octane number produced results which have given a severe jolt to military aeronautics.

An outstanding pioneer type was

The Martin B-10 bomber has met with extraordinary success. With two Wright Cyclone engines of over 700 h.p. a speed of 215 m.p.h. is attained. An improved type is at present the subject of Air Corps experiments.

the Boeing bomber, built five or six years ago. With two Pratt and Whitney Hornets, of a type now obsolescent, this machine was capable of over 180 m.p.h., and could carry a bomb load of 2,400 lb. Its two Hornets were mounted forward of the leading edge of its cantilever wing, its undercarriage was retractable (but bombs were carried externally), and its fuselage was characterised by almost constant depth from nose to tail. This type was never put into quantity production.

Probably the most successful bomber so far produced in America is the Martin, the B-10 version of which is, perhaps, the best known. A description of this type was given in *Flight* of September 19 last year. In everyday use with the U.S. Army Air Corps, a number of Martins are putting up some brilliant performances, and not long ago a group of them distinguished itself by making a fast survey trip into Alaska. Without doubt the Martin has a higher performance than any machine of its type in service with any air force.

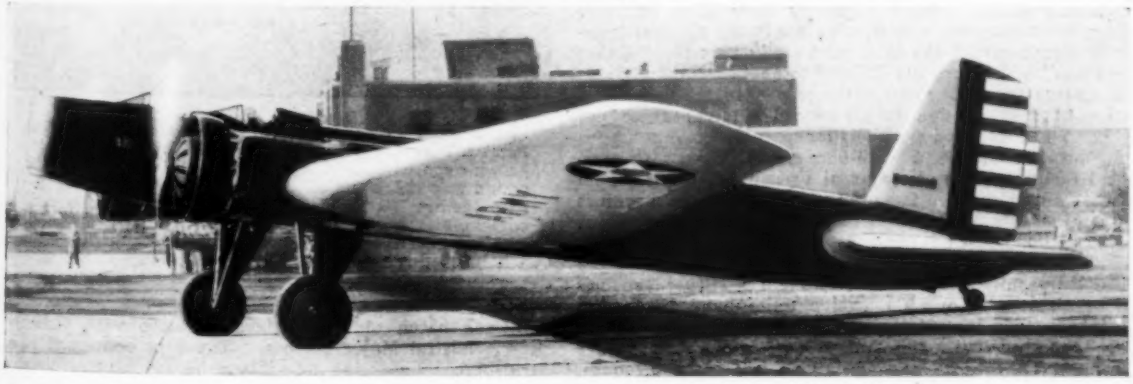
A New Martin

The past few months have seen the appearance and initial tests of a new and much-improved Martin bomber —a development of the B-10—which is entered in the present U.S. bomber competition alongside a new Douglas. The Boeing entry, the four-engined 299, was destroyed in an accident. Like its forerunner, the Martin is a mid-wing all-metal monoplane carrying a normal crew of four or five. Three Browning guns are provided, and the bomb load is stowed internally, being released through trap-doors in the "belly." The engines are of an improved Wright Cyclone type, giving over 800 h.p. each, and driving Hamilton constant-speed aircrews. The span is 76ft., the all-up weight about ten tons, and included in the equipment are a radio compass, automatic pilot and two-way radio. Having regard to the cleaning-up (the three cockpit installations merge into the lines of the fuselage more efficiently than on the B-10) and the extra power, the maximum speed should be at least 235 m.p.h., for the B-10 does 215 m.p.h. at 6,500 feet.

Some time ago, it is reported, the French Governmeut was considering ordering a number of Martins, but no contract was ever placed. One French manufacturer, who has lately produced a somewhat startling *multiplace de combat* monoplane comparable with the Martin, has taken the somewhat unethical course of publishing, in his house journal, a tabulated comparison between his product and the Martin B-10. He proceeds to show that the French machine stands head and shoulders above the American on almost every score. Certain discrepancies appear to have crept in, however, and as a document of extreme technical importance the table has not been received with acclamation.

One of the greatest blows struck at American military aviation during recent years was the recent disaster to the Boeing 299 bomber. The story goes that the pilot took off for a test flight with locked controls, and that the machine crashed from 200 feet. Measuring about 100 feet in span (roughly equal to the Fairey Hendon, which is less than half as powerful) the 299 was fitted with four Pratt and Whitney Hornets mounted in line abreast along the leading edge of the cantilever wing. The undercarriage retracted into the nacelles of the inboard power units. Armament installations of a secret nature featured in the design, and an automatic pilot, two-way wireless and a radio compass were specified. Before it was destroyed the 299 distinguished itself by flying for 2,300 miles at an average speed of 232 m.p.h.

There are indications that the four-engined bomber will soon assume a prominent place in the equipment of the major air services. The Boeing company is said to have up its sleeve another machine of this type, to be fitted, according to one report, with prestone-cooled Allison "X" engines of about 1,000 h.p. each, and in Europe the Farman



A pioneer type in the development of the modern long-range high-speed bombing monoplane, this Boeing, built five or six years ago, was capable of 180 m.p.h.

Company, among others, has done a large amount of development work with this class of aircraft.

Douglas's entry in the U.S. competition is distinctly reminiscent of the D.C.2 commercial machine, and doubtless its structure contains numerous features common to both types. The fuselage differs considerably, however, having a "belly" somewhat similar to that of the Martin, which makes it a mid-wing monoplane. Two Wright or Pratt and Whitney radials are mounted, and the undercarriage, which seems to be very similar to that of the D.C.2, retracts into their nacelles.

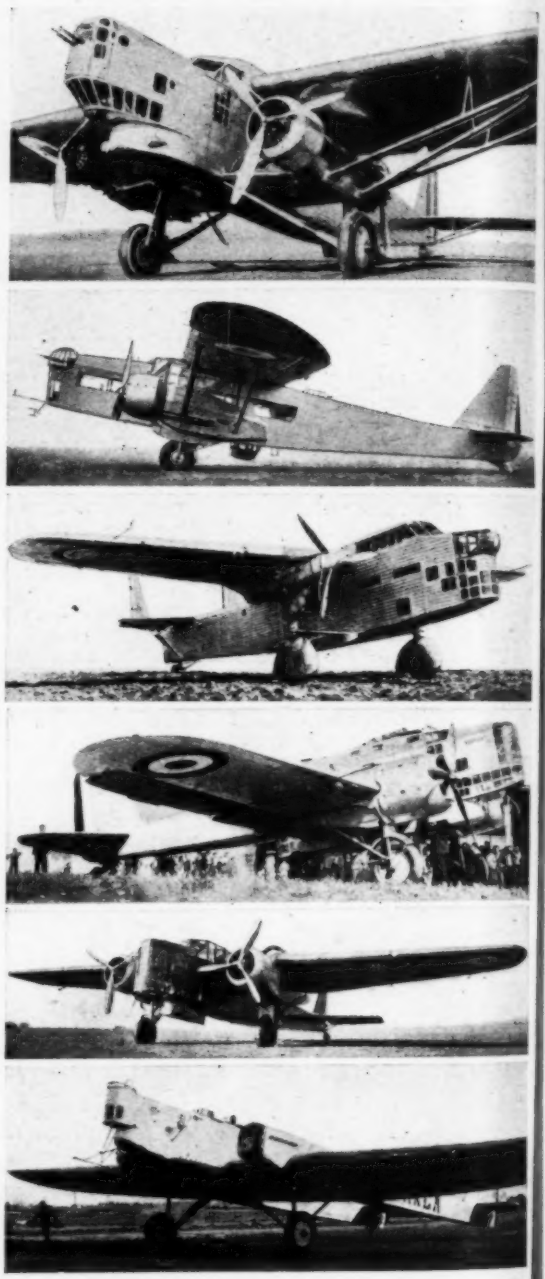
Although the low- or mid-wing cantilever monoplane is by far the most strongly favoured type for use as a heavy bomber, some interesting bombers have been built with various other layouts. Outstanding among these is the Bellanca. A high-wing sesquiplane is, perhaps, the best description of this machine, the bracing struts being arranged as aerofoils. Fitted with two Wright Cyclone F-type radials giving 715 h.p. at 7,000 feet, this machine is capable of 190 m.p.h. It is possible to convert it into a seaplane—in which form it has been supplied to the Colombian Government—in an extremely short space of time; on floats it does 175 m.p.h.

The British Position

In the eastern hemisphere some extraordinarily interesting heavy bombers have recently made their appearance. No particulars are available for publication of the "big stuff" which is known to be on the stocks in more than one aircraft factory, but, judging from the obviously excellent performances being shown by the new bomber-transports—even with their capacious fuselages—Great Britain will easily make up any ground she may have lost in the construction of big bombers within recent years. Until these new bombers reach the production stage R.A.F. squadrons will receive the Fairey Hendon and the improved Handley-Page Heyford with speeds in the 150-160 m.p.h. neighbourhood. Lord Londonderry himself has stated in the House of Lords that the Air Ministry has placed a contract for delivery, not later than next February, of a new type of heavy bomber believed to be an advance on any comparable machine in service with foreign air forces. Because of the recommendation tabled by the British Government at Geneva in 1933, that the maximum permissible unladen weight of military aircraft should be three tons, the design and development of very heavy bombers in this country was postponed. Lord Londonderry explained in his speech to the Lords, however, that the latest replacement type of heavy bomber would exceed that figure by nearly 100 per cent. This means that we may reasonably expect machines weighing, with full load, about 25,000 lb., or about 5,000 lb. more than the Fairey Hendon.

Recent French bombers and B.C.R. machines (the latter type, which is often termed the *multiplace de combat*, is capable of performing fighting, bombing and reconnaissance duties) exhibit numerous uncommon features. They are among the ugliest machines in the air, and there is no denying that the later ones really look the "flying citadels" which they are claimed to be. Maximum speeds of current types range from 170 m.p.h. to 240 m.p.h. A crew of four or five is accommodated and there are sheltered or turreted positions for at least three guns, including in some cases a small-bore *canon*. Even with overload fuel the range of a typical French bomber is by no means sensational; in fact, the majority of these machines are rather worse off in this respect than contemporary or even earlier British types.

Five squadrons are already equipped with the Potez 540 B.C.R. machine which, with two 690 h.p. Hispano engines does about 190 m.p.h.; twelve units have Bloch 200 bombers (twin Mistral Majors) and two further squadrons are equipped with the Amiot 143, which has similar engines. The Potez and the Bloch will carry 2,200 lb. of bombs for 620 miles, but the Amiot is capable of carrying over 3,000 lb. of bombs for a similar range. It has been reported that the French Government has ordered a fair-sized batch of four-engined Farmans with Gnome-Rhone Mistral Major engines. The type concerned is a strut-braced high-wing monoplane having a gross weight of approximately 40,000 lb. and a speed of 200 m.p.h. if a retractable undercarriage is specified. Civil versions of this type are under construction for Air France. Incident-



Half-a-dozen Frenchmen: (From top to bottom) The Farman F-221 (four 800 h.p. Mistral Majors); the Potez 54 with two engines of similar type; the Bordelais A.B.80 with a pair of 860 h.p. Hispano Y's; the new Breguet 460 (two 800 h.p. Mistral Majors); the Farman with the same engines, and the S.P.C.A. 30 M.4 (two 650 h.p. Lorraines). The last is considerably older than the other machines but is interesting because its tail is carried on two booms.

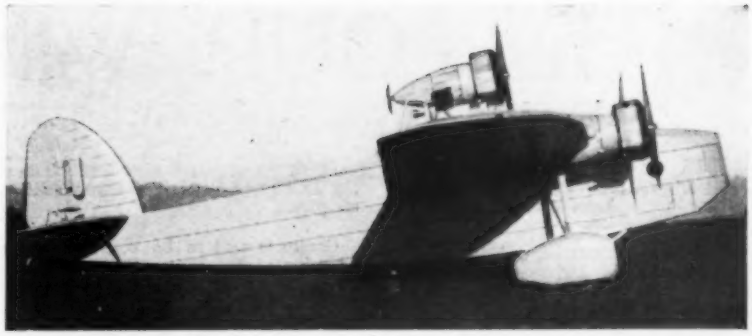
ally, the Potez 54 already mentioned has also been produced as a civil type for that company and is now in service.

The great majority of the new French bombers are of metal construction, even to their skins, but one of the newest of them—a Farman product known as the type 420—is of wood. With two of the new Gnome-Rhone 14 Krsi radials of about 900 h.p. it does between 210 and 220 m.p.h. at 13,000 ft. and is reported to be an exceptionally sturdy machine. On test it was dived up to 290 m.p.h. Fully loaded it weighs about 1,600 lb. less than our Heyford.

And what of the Italian bombers which, of late, have been the talk of the town? Certain of the new and experimental types, there is no doubt, show considerable merit, in performance at least. The squadrons, however, for the most part are still using a variety of obsolescent machines, although it seems that the Savoia Marchetti S.81, which is generally similar to the triple-engined Savoias used by Sabena, is already going into service. This type, it may be recalled, is a low-wing cantilever monoplane with a fixed undercarriage. The military machine is fitted with three Alfa Romeo 125 RC radials (Bristol Pegasus built under licence) and is claimed to do 217 m.p.h. at 13,000 ft. Figures for range and bomb load have not come to hand, but the civil machine, with three Piaggio Stellas of similar power, carries 3,960 lb. in the shape of passengers and baggage and, with full tanks, has a range of 994 miles.

The Piaggio concern, ever noted for originality, has built a very fast three-engined bomber which does 248 m.p.h. at 16,400 ft. Carrying a 2,200 lb. bomb load it can fly for 930 miles, but with half that weight of bombs is said to be able to make 1,242 miles. Unorthodox features include a centre section which tapers in thickness and is set at a negative dihedral angle and a gunner's position in the rear of the fuselage directly beneath the fin, which gives the tail a curious "cocked-up" appearance. The Piaggio Stella IX RC 40 radials with which it is equipped are furnished with two-stage superchargers and drive controllable pitch airscrews.

There have been stories of bomber versions of the great Savoia S74 monoplane used by Ala Littoria and of the smaller type of three-engined Savoia which recently gained for Italy a substantial batch of speed-with-load records. In civil guise these machines do 205 m.p.h. and 267 m.p.h. respectively, which means that the latter is just about as fast as our Bristol 142, although it is rather larger and heavier.



The Dornier Do.Y bomber (top) did 155 m.p.h. with three Jupiters of an old type. Three Piaggio Stella IX RC 560 h.p. radials with two-stage superchargers give the Italian Piaggio P.16 (below) a speed of 248 m.p.h. at 16,400 ft.

Fitted with four Hispano Suiza 12 Ybrs engines of 860 h.p. the Potez 41 bomber, which met with disaster, weighed 37,400 lb. fully laden and was capable of over 190 m.p.h. at 13,120 ft. Its undercarriage was retractable.

COMBATING AIRSCREW ICE

IN co-operation with the American industry, the U.S. Bureau of Air Commerce has developed a device for clearing the ice which forms on airscrew blades.

This consists of a "slinger ring" which provides for a continuous flow of anti-ice solution. Three tubes extend from the ring along the leading edges. On the whole, it is very similar to the device which has been developed by Mr. Lockspeiser and which is being marketed by the Dunlop company.

Incidentally, it may not be generally known that the Goodrich company, which was responsible for the first production de-icer, operates a refrigerated wind tunnel for icing experiments, and this company has secured the contract for the manufacture of the new airscrew protector.

THE FOUR WINDS

ITEMS OF INTEREST FROM ALL QUARTERS

SOME seventy firms have already signified their intention of participating in the Aerodrome Owners' Association Exhibition.

The Exhibition is being held in connection with the Airports Conference at British Industries House, Marble Arch, London, on January 30 and 31.

Future Avro Ansons are likely to be fitted with trailing-edge flaps.

Three hundred calves of British stock have been flown 360 miles from Lima to Cuzco, Peru.

An automatic stabilising system with some interesting possibilities is described in this issue.

Aeroplanes flying at 145 m.p.h. have been used for planting young fish in Canadian lakes.

Soryu is the name of the latest Japanese aircraft carrier, launched recently. She displaces 10,050 tons.

The Portuguese Navy will be granted £400,000 during 1936 for the purchase of seaplanes and motor launches.

Fresh proposals are afoot for illuminating Blackpool Tower for the benefit of air pilots.

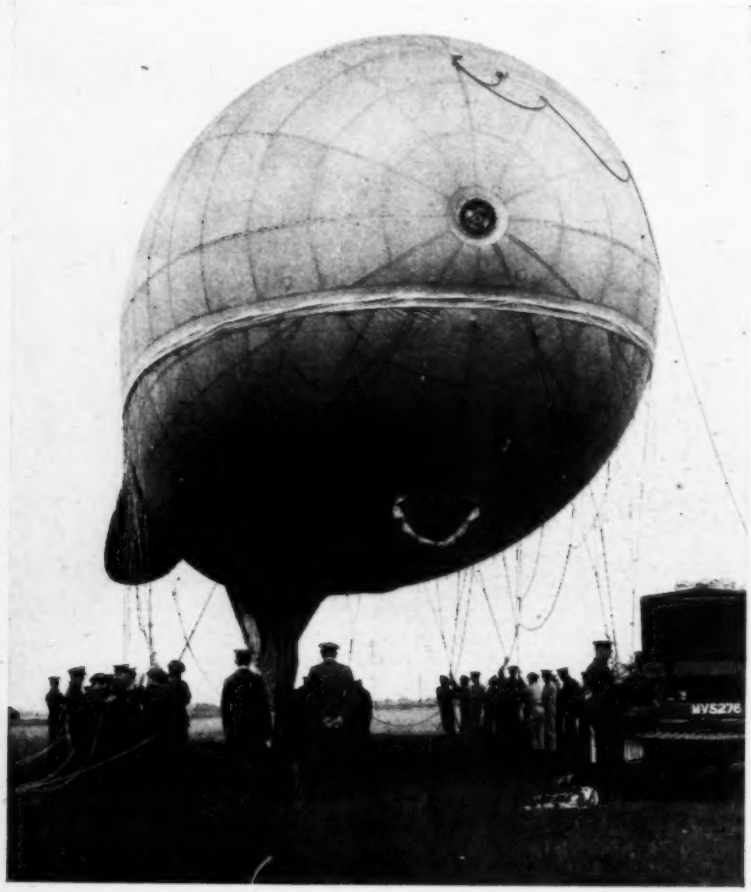
Greece is said to be considering the adoption of the Vultee V-11 (see pages 42c and 42d) or the Northrop attack-bomber.

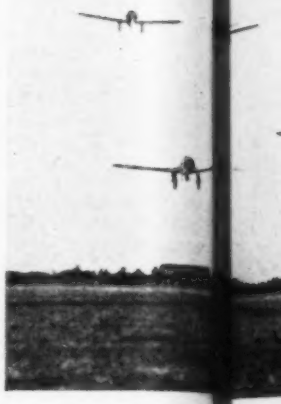
According to the *Paris Midi*, France has the strongest air force in the world, having practically completed in one year her three-year modernisation programme.

"Airboy, Propeller Slashed over Sea, says 'I am Fed Up'"—heading, in an *English* newspaper, to story of Roy Gropler's eventful flight Australia-wards.

The wrecked Imperial Airways *City of Khartoum* was salvaged on Monday, 71 mailbags and parcels being recovered. Most of the mail was deliverable.

Reports that French aero engines are being sent *via* Hamburg to Italy have prompted the French Government to order a strict investigation of the books of every manufacturer.





HOME FROM THE STRAFE. Eighteen Curtiss A-12 attack monoplanes (700 h.p. Cyclone F) of the United States Army, land simultaneously at the eighth annual all-American air manœuvres at Miami, Florida. The bulbous object beneath the fuselage of each machine may be either a long-range tank or a bomb.

Frenchmen Found

M. de Saint-Exupéry and his mechanic, who were lost in the desert for three days on an attempt to establish a new Paris-Saigon record, have been found 95 miles east of Cairo

Better Luck Next Time!

Condolences to Flt. Lt. "Tommy" Rose, who set out early last Tuesday in the King's Cup Falcon Six for the Cape, only to be forced down at Abbeville, France, by ice. The machine was damaged in landing in the dark.

Touching the Turk

A law has been submitted to the Grand National Assembly in Angora whereby all persons receiving salaries in Turkey will be required to contribute two per cent. of their earnings to military aviation.

For the Modern Boy

Mr. T. Campbell Black opened last week an "Exhibition for the Modern Boy" at Selfridge's, London. Among the exhibits are Mr. Appleby's cross-Channel *Pou*, a Jubilee Monospar, an Aeronca, a

KITE-FLYING. Modern spotting aircraft notwithstanding, the kite balloon may preserve its utility in future warfare, and the R.A.F. Balloon centre at Larkhill, Salisbury Plain, sees to it that its pupils become proficient in lighter-than-air technique. Since it provides a steadier "platform" than does an aeroplane, the balloon may prove superior for certain forms of photographic reconnaissance.

Kestrel engine, and an airscrew in various stages of construction.

Mr. Fokker To Advise

An official committee favours the erection of a new aircraft factory near Amsterdam. It is proposed that the Dutch Government and Mr. Antony Fokker shall each contribute £135,000 to cover the cost, and that Mr. Fokker will not be a director, but an advisor.

Twenty-five Years Ago

(From "Flight" of January 7, 1911.)

"While flying his Farman biplane along the sea shore at Genoa on Monday week, the Italian aviator, Cirri, was caught by a sudden gust of wind and blown out to sea for a distance of about a mile and a half. Stopping the motor, the aviator brought the machine down suddenly to the surface of the water from a height of 150 feet, and he was picked up by a torpedo boat little the worse for his thrilling adventure."

Fast Amphibian Douglas

A new Douglas coastal patrol amphibian of the U.S. Army, fitted with two Wright Cyclone engines, has flown the 919 miles between San Juan, Porto Rico, and Chapman Field, Florida, in 7 h. 12 min., averaging about 146 m.p.h. Of the 1,120 gallons of fuel carried at the start, 475 gallons remained when the machine landed.

More Human Propulsion

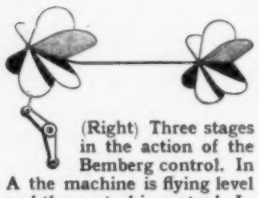
The *Berliner Tageblatt* reports that a man named Kaiser in Bohemia is the second person successfully to have flown in a machine propelled by human strength. He flew twice round the town of Plauschnitz, and had set off over a wood when the fabric of one of the wings split and he fell to the ground. The pilot escaped injury.

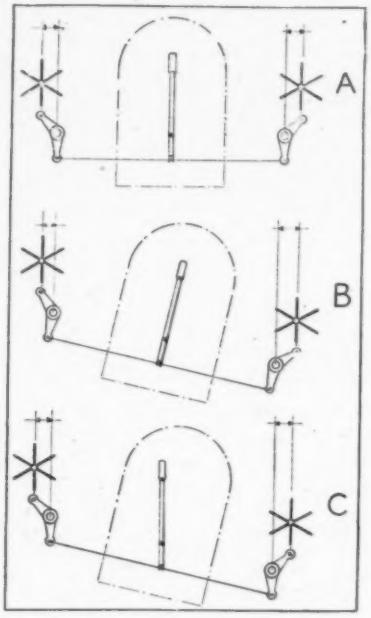
THREE DAYS TO CHILE. Air France inaugurated its South Atlantic mail service last Saturday. In the left-hand photograph, taken at a party held in London to mark the occasion, Miss Jean Batten is seen handing a letter to M. Bouderie (Air France Superintendent of Flying). On the right is a scene at Croydon on Saturday, with the mail being loaded into a Wibault-Penhoët for the first stage.

LATERAL STABILISATION

Argentine Engineer Utilises Vertical Aerodynamic Force to Operate Ailerons

WITH a view to simplifying the piloting of aeroplanes many brains have been at work on evolving schemes for reducing the number of controls which the pilot has to operate. In the *Pou du Ciel* M. Mignet has done it by omitting the ailerons altogether. This method is not entirely above criticism, as there *are* times when one wants to use a direct lateral control. Moreover, the suppression of ailerons is only practicable on an aeroplane of low wing span. Another method is the rocking wing arrangement of the Italian inventor Jona, described in *Flight* of October 10, 1935. The Jona system is applicable to biplanes only, as normal ailerons are fitted to the lower wing and the automatic ailerons to the top wing. Some ten years ago or so yet another system was tried out in this country, on an Armstrong-Whitworth Argosy, if memory serves. In this system a vertical surface placed behind the trailing edge was geared by levers to the aileron control in such a way that sideslip caused the aileron on the side towards which the machine was slipping to be depressed.





(Right) Three stages in the action of the Bemberg control. In A the machine is flying level and the control is centred. In B the aeroplane is tilted to the right, and the starboard "kite" exerts a greater pull than the port one owing to difference in leverage on the two sides. The result of the unequal pull is shown in C, where the two cranks are symmetrical, having pulled the control column over to the left, thereby depressing the starboard aileron. The action is shown in stages for clearness; actually it would, of course, be instantaneous. The "kite" used is shown in the small sketch above. The multi-wing arrangement is used in order to make the "kite" effective whatever the angle at which the air stream strikes it.

From France now comes news of yet another system, which has been tried out experimentally and seems to promise fairly well. This system, the invention of an Argentine engineer resident in France, consists, according to our French contemporary *Les Ailes*, of a pair of "kites" linked to the lateral control in such a way as to operate the ailerons always in the desired direction under all conditions of flight.

Promising Results

After experimenting with different methods, M. Bemberg evolved the following scheme, which has been tested on a De Havilland Moth with promising results.

Placed at convenient spots, such as on the front inter-plane struts, for instance, are two crank levers, one on each side of the machine. The two arms of each lever are set at an angle of 135 degrees to each other. The two lower arms are joined by a cable, and are normally vertical. The upper arms of the levers will then, of course, be at an angle of 45 degrees above the horizontal. It will be obvious that if a vertical force could be supplied to the upper crank arms there would, when the aeroplane as a whole was tilted to one side or other, be a difference of pull on opposite sides, due to the fact that one crank arm would be nearly horizontal and another nearly vertical. For a 45-degree bank one crank arm would be quite horizontal and the other quite vertical. This, of course, assumes that the vertical force on each side is always acting vertically, and is more or less constant, irrespective of speed.

M. Bemberg supplies this vertical force in the form of two "kites," one anchored to the port crank lever and the other to the starboard. The kites are of rather special design, but this has little to do with the principle of operation. Fundamentally each kite consists of a set of aerofoils in tandem, the front set being at an angle of approximately 15 degrees in relation to the rear set. In flight the rear set of fin surfaces forms the tail of the kite and keeps the front set, or wings, always at an angle of 15 degrees to the airflow. Being universally mounted, the kites always face into the relative wind, whether the aeroplane is ascending, descending, or sideslipping. The force on them is always acting in a vertical direction, and varies according to the airspeed only, as they are flying at constant incidence.

Details of the Bemberg system are shown in the diagrams. The cable which connects the lower arms of the two crank levers is connected in some convenient way to the aileron control. In our diagrams it is shown connected to the lower end of the joy stick, but any other connection can be made, according to the force of pull required.

In normal flight the two kites pull equally on opposite sides, and there is no tendency to move the joy stick either way. But if the machine is tilted to one side or other the system comes into action. If, for example, it is imagined that the aeroplane is banked to an angle of 45 degrees to the right, the pull of the starboard kite on its crank arm will be at right angles to the arm. The pull of the port kite will be in continuation of the crank arm, which is then pointing straight upwards. Obviously a maximum pull is exerted on the starboard crank and no pull on the port tending to move the control stick. The result is that the starboard aileron is pulled down and the aeroplane brought to a horizontal position. In the diagrams the action has been shown in two distinct stages for clearness. Actually the controlling force is applied instantaneously as soon as the smallest bank occurs.

Sideslipping is corrected in the same manner, because if the machine sideslips to the right, for example, the two kites will shift their line of lift to the left, so that the differential setting of the crank arms results in a greater pull on the starboard than on the port side, and the starboard aileron is thereupon depressed.

Pilots who have flown the Moth fitted with the Bemberg experimental control appear to think highly of it, one advantage being that manual control by the pilot is available whenever desired, so that sideslips *can* be made if found advisable during a landing approach.

De Havilland Development

IT is announced that the net profits of the De Havilland Aircraft Company for the year ended September 30 totalled £77,367, the largest figure recorded since the company became a public one in 1928. The increase on the previous year was £26,373.

The ordinary dividend is raised from 7½ per cent. to 10 per cent., the 100,000 £1 shares issued last March ranking for dividend as from April 1 last.

Aviation as a Career

"Aeronautical Engineering and Commercial Aviation," with a Foreword by Capt. Geoffrey de Havilland, C.B.E., F.R.Ae.S., A.F.C. (No. 1 of "Your Start in Life" Series). (Geoffrey Rwington Publications, Ltd. 6d. net.)

THIS little publication gives a general idea of the opportunities offered to a young man by choosing aeronautical engineering or commercial flying as a career. The details included should be of great help to parents and guardians.

Private Flying

Topics of the Day

An Interesting Point

ONE of the most usual questions asked of the amateur by the interested outsider is: "Do you carry a parachute?" The answer, of course, is a negative one, and the enquirer's eyebrows usually rise quite significantly with a "Why?"

There are probably a dozen good reasons why the average club pilot or owner does not normally wear a 'chute—not the least important one being the fact that very few light aeroplanes are designed so that the unfortunate pilot can remove himself quickly in emergency, or, even, that it is possible to enter with any ease. Training types which have been primarily designed for Service or for Reserve flying are notable exceptions, and one can now obtain parachutes which are both comfortable and convenient when worn in cabin machines.

The Case for Parachutes

ADMITTEDLY, it is only in very rare emergencies that one is safer when separated from one's aeroplane, but, when a parachute *is* wanted, it is wanted very badly indeed. I often wonder whether it might not be encouraging to prospective members if a club with suitable machines made a point of supplying such "life-belts" for use, at least, during aerobatic instruction or practice. Aeroplanes have been known to break up while in the hands of clumsy or careless pilots.

Only last week a well-known private owner found it necessary to leave a machine which had, according to all accounts, caught fire in the air. Unusual enough, perhaps, but not altogether unknown, and the said private owner probably felt that his money had been rather well spent as he floated down in comparative safety.

An Emergency Measure

MANY years ago, while fiddling with the mixture control at 9,000 ft. or so, I suffered a severe blow-back—or what appeared to be a blow-back—and that alone might possibly have caused at least a local fire. Curiously enough, last week, after practising loops and Immelmann turns for twenty minutes in a machine I had hired, the engine blew a gasket. It was "a very little gasket," and the effects were only really noticeable at small throttle openings. Here, again, the unreasonably weak mixture might possibly have caused trouble if the unaccustomed vibration had not sent me hurrying back to the aerodrome with my heart in my boots.

One New Zealand flying club has, I hear, standardised parachutes, which will be part and parcel of the machines. This club, however, flies over the least hospitable of terrain, and the probability is that it would usually be safer to "bale out" in any case if an engine failed when the machine was well away from the aerodrome.

At any rate, there are a sufficient number of "pros." to make the idea of the parachute well worth consideration in spite of a necessarily high initial cost and of the minor inconveniences involved in its personal application to the casual aeronaut—who is sometimes very casual indeed. Like the cyclist who seriously risks his neck rather than expend a few shillings on a really useful rear reflector or lamp!

Real Weather

I OFTEN wonder whether the amateur pilot who seldom travels by air line fully realises the real wickedness of the conditions in which a transport pilot will take off—or even land provided that some form of blind approach device is installed at the airport. If we cannot see the farthest boundary of the biggest aerodrome we very wisely wheel our machines back into the hangar.

In conversation recently with a man who has, during the past few years, been very closely connected with internal and semi-internal air-line operation, I heard of the most staggering performance by pilots who would be the last to expect decorations for their work.

About a year ago, at a well-known airport, the early morning passengers for a certain destination arrived to find a fog which reduced the visibility to a matter of yards. The chief pilot threw his hand in, but another pilot, who felt that he knew his machine well enough, took off "from the tarmac." Thereupon the chief pilot went out to see what he could do. For a quarter of an hour he taxied around in an attempt to find the distant boundary whence he could open up, knowing that he had an absolutely clear line.

Forced Induction

SINCE blind-flying instruments, as at present fitted, do not start functioning at once, each of the pilots must have flown on the A.S.I., compass and bank indicator for the initial five minutes or so.

On another occasion a pilot had refused to take off for this very good reason, when he had a sudden inspiration. Obtaining a compressed-air bottle he opened the tap and applied the jet to the venturi for half a minute or more. He then timed the period during which his turn indicator functioned, and found that this was five minutes. He bundled his passengers into their seats, warmed and ran up his engines, leapt out, applied the jet of air to the venturi, and took off.

Early last year I sat in the second pilot's seat of a big machine which was being brought partially into Le Bourget on the "ZZ" system. The radio operator sang out the bearings, and the only real physical or mental discomfort was caused by the fact that the cloud condensations came through the windscreen!

INDICATOR.

Private Flying

FROM the CLUBS

Events and Activity at the Clubs and Schools

REDHILL

Flying times for the week ending January 3, during which Mr. John Dade qualified as an instructor, totalled 48 hr. 35 min.

LONDON

Messrs. H. R. B. Waters, B. C. Frost, A. C. Wishart, and T. Q. Smith have become members. Last week's flying time was 32 hr. 15 min.

LEICESTERSHIRE

The December flying returns of the Leicestershire Aero Club, Ltd., totalled 35 hr. 25 min. The Christmas fancy dress party and dance was held in the clubhouse on December 13.

CAMBRIDGE

A charter trip was made to France with the Monospar on January 1, the passenger being Mr. Victor Rothschild. Flying times for the week ending January 4 totalled 21 hr. 15 min.

HANWORTH

An Airspeed Envoy belonging to R. K. Dundas, Ltd., and piloted by Mr. Bramson is being housed at Hanworth. Flying time for last week totalled 25 hr. 15 min. Mr. Lawton has become a member.

PORTSMOUTH

Although flying was only possible on three days of last week, the records show 20 hr. 10 min. Messrs. J. K. Buchanan and A. B. McKee took their "A" licences, and Messrs. Sadler and Lane went solo. Mr. Stratford has joined the Club.

NORFOLK AND NORWICH

Club activities opened after the Christmas holidays with a New Year's Eve dance. Demonstrations were given last week of the Miles Hawk and Falcon, which were brought down by Mr. P. King, a member of the Club, and by Mr. C. O. Powis.

BRISTOL

Fifteen impossible flying days kept the flying time for December down to 36 hours. The *Pou-du-Ciel* will probably be demonstrated on Saturday and Sunday, January 25 and 26, and the Club annual ball is fixed for February 28. The Christmas party on December 19 was a pronounced success.

YORKSHIRE

Club machines flew 18 hr. 20 min. during the past fortnight. Flying time for December was 50 hr. 40 min., and the final total for 1935—a record for the Club—was 1,530 hr. 25 min. Mr. J. Barber passed his "A" licence tests, and a children's party was held in the clubhouse on December 30.

LIVERPOOL

On sixteen days of December instruction was almost impossible, and the flying times totalled only 79 hr. 30 min.

Any member paying a deposit of £25 for flying time will now be allowed a "rebate" of 10 per cent. in the way of free flying providing that the £25 is used within twelve months of the date of deposit.

The annual dance will be held at the Grosvenor Hotel, Chester, on February 28, and there will be an informal dance at the clubhouse on Saturday, January 18.

C.A.S.C.

During 1935, 280 hr. were flown by members of the Civil Aviation Service Corps, and seven "A" licences were obtained, the last two by Messrs. Molyneux and Roberson. On Sunday, January 5, 4 hr. 25 min. dual and 1 hr. 50 min. solo flying was recorded.

HESTON

The Airwork School of Flying has flown 2,966 hours in the 217 flying days of 1935. Sixty-two pilots' "A" licences were gained. Blind-flying has been nearly doubled. Seventeen blind-flying certificates have been issued, as compared with nine in 1934 and three in 1933. 136 hours' blind-flying was carried out during the year.

NEWCASTLE-UPON-TYNE

First solo flights were made last week by Miss M. Nettleton and Mr. L. Sample. Mr. H. Mitchell obtained his instructor's certificate. Dual and solo flying totalled 25 hr. 45 min. The annual dinner dance is being held at Tilley's Barras Bridge Assembly Rooms, Newcastle-upon-Tyne, on Friday, January 17.

TOLLERTON

There was considerable reduction in flying times for the week ending December 26 through fog and generally unsympathetic weather. One new associate member joined the ranks, and a dance, held on December 20, was attended by about 120 members. Although the Club was closed on Christmas Day, members of the staff were given joy-rides in the Hornet.

SOUTH COAST

The weather during Christmas week was hard on flying, but eleven hours were recorded. The annual general meeting will be held on Saturday, January 11, and will be followed by a dinner in the Airport restaurant. Among the new members last week were Messrs. Cornish, Head, Moore, and Mr. and Mrs. Hudson-Keep. The annual dinner and dance will be held at Warnes Hotel, Worthing, on February 7.

READING

Fog, rain and high winds did their best to handicap flying last week, but Club machines were in the air fairly constantly. Six new Miles Hawk Trainers have been added to the fleet of the Reserve school. Messrs. Day, St. George-Stead, and Sciortino became pupils.

The next Club dance is being held on Saturday, February 8, and members and friends are asked to come dressed as characters from certain films.

YORKSHIRE

The grand total of flying times for 1935 was 1,158 hr. 35 min. During December the figure was 50 hr. 45 min.

Yorkshire Aviation Services have been demonstrating the little Hillson Praga. Mr. T. C. Pick, one of the company's pilots, has just returned from a tour with this machine, in the course of which he visited Yeadon, Newcastle, Edinburgh, Glasgow, Carlisle, Blackpool, Woodford, Speke, and Barton. The average petrol consumption worked out at only two gallons an hour.

An agreement has been reached with the newly formed Harrogate Aero Club by which members of the Yorkshire Aviation Services Country Club, Ltd., shall have the advantages of membership of three clubs for one subscription during 1936; York, Leeming and Harrogate are the centres concerned. The Club's annual dinner dance is to be held at the Grand Hotel, Harrogate, on Wednesday, February 12.

THE FIRST OF A SERIES: On his first flight with his new *Cambridge* sailplane, the Duke of Grafton (right) obtained his "C" certificate. This machine, designed and built by Zander and Weyl, is the first of a small series and has already proved itself with soaring flights of more than an hour's duration.

CASTLE BROMWICH

For the three weeks ending January 2 flying times amounted to 28 hr. 15 min. dual, and 5 hr. solo. Mr. K. Lister has joined the Club.

YAPTON

The flying total for December at Yapton was, owing to unfavourable weather conditions, very poor, only 35.00 hr. being logged. Messrs. P. H. Alington and A. Pringle-Fraser obtained their "A" licences. The forced landing and bomb-dropping competition on the 14th was won by Mr. P. H. Alington, with Mr. C. G. Alington (his brother), and Miss M. Marshall as second and third respectively. The Club has been approved for blind-flying instruction.

BROOKLANDS

Messrs. Ken Waller and Dennis Rea returned last Monday week with a party of pupils from a "flying" week-end at Le Zoute. Capt. Finlay has given a fair amount of instrument flying instruction in face of bad weather, and Dr. Ridsdel has gone solo. On Saturday, the weather having improved, Club machines flew 15 hr. On Sunday ten members formed a party and flew to Shoreham for lunch. New members include Messrs. Mellstrom, Lawson and Mackenzie.

HERTS AND ESSEX

Ten non-flying days during the last four weeks reduced Broxbourne's flying hours very considerably. The total time for December was 86 hr. 35 min., of which 10 hr. 30 min. were logged on Boxing Day. The Club fleet now numbers seven, an additional machine, a Gipsy Moth, having been obtained. New members are Miss D. H. Lee and Messrs. F. E. Radford, J. E. Adams, and H. W. Earle.

The Boxing Day Party outshone any previous parties in the clubhouse. Mr. and Mrs. Len Walters were the winners of the Broxbourne Flitch. The "Flitch" was substituted by a firkin of the local brew, and was consumed without effort.

CINQUE PORTS

The final returns at Lympne revealed that the flying total for 1935 was over 500 hours more than that of 1934. The 2,000 hr. mark was passed several days before the end of the year. It is hoped that with the increased fleet of aeroplanes available this year, a new record of at least 3,000 hr. will be established.

Mr. A. J. Drake, who, several years ago, was secretary of the Club, has returned from Penang and rejoined as a flying member. Mr. Peter Tomlinson, who already has his "A" licence, Mr. Nash, and Mr. Hackney, have also joined. During the holiday Mr. Du Port and Mr. Morris took the former's Moth Major for a tour of other clubs.

Soaring Problems

IN the interests of a thorough and critical research into the matter of soaring flight, the Soaring Flight Co., of the Departmental Bank Building, Washington, D.C., is issuing a regular letter circular entitled *The Soaring Cycle*.

The first issue is devoted to a review of observations by naturalists of soaring birds, while the second issue includes the consideration of a possible theory to explain soaring flight which does not apparently involve the use of mechanical or thermal up-currents.

Anyone interested can, by writing to the company, obtain the two initial circular letters gratis.

Two More "Pou" Clubs

YET another *Pou* club has been formed—this time near London. The Air Sports Club of Thames Valley is not only arranging for hire flying in the ordinary way, but is also, it appears, to have a number of *Pous* made for purchase on easy payments lines. According to information received from the club, a fifty-acre landing field, with accommodation, will soon be available and orders for thirty machines have already been received. The secretary's address is: North House, High Street, Thames Ditton (Emberbrook 1955).

At Ashingdon, Essex, a *Pou* club known as the Aero-8 has been in existence now for three months, and was, in fact, one of the first to be formed in the country. There is flying every week-end at Canute Air Park, and a clubhouse has been built.

Since the *Pou* in its present form is a single-seater, instruction must necessarily be given by means of a series of lectures and films, with, of course, ground instruction. The club subscription is 2s. 6d. per annum, and the flying rate is 15s. an hour. During the summer it is possible that a holiday camp will be arranged, and a dance is to be held at Westcliff on February 5. The aerodrome lies beside Lower Canewdon Road, Ashingdon (Canewdon 31).

FOREIGN STAMPS SHOW BRITISH AIRCRAFT

SENOR JUAN DE LA CIERVA is not without honour in his own country. On a new Spanish postage stamp appears a picture of one of his products—a three-bladed wingless Autogiro, apparently of the C.30 type constructed in Britain. In spite of its aeronautical subject, the stamp is not intended solely for air mail.

Another British-built machine, this time of British design also, is shown on stamps from Mozambique (Portuguese East Africa). It is an Armstrong-Whitworth Atalanta, of the type used by Imperial Airways on their African route, and the stamps have been issued because a feeder line now joins Salisbury, on that route, to Beira. An air view of this important harbour town appears below the machine.

* * *

From the United States comes a 25-cent stamp whose purpose is made clear by its design. At the top is the inscription "Trans-Pacific Air Mail," with "November, 1935" below, and, below that again, a front view of the *China Clipper* flying-boat whose successful ocean crossing was recorded in *Flight* a few weeks ago.

Steamships at one side of the stamp and junks at the other emphasise the difference between the two continents that the Pacific airway seeks to join.

The postal authorities of the Philippine Islands must have been so excited by the arrival of the *Clipper* that they could not wait to prepare new stamps, for they overprinted an existing issue with the world "P.I.-U.S. Initial Flight, December, 1935," and a rough picture of the flying boat. Half-a-million copies were produced of the 10-centavos issue, and 350,000 of the 30-centavos, but despite these large quantities the supply was very soon exhausted.

* * *

Sabena, like our own Imperial Airways, is not above gaining revenue from sources that the outsider might consider negligible. The Belgian company offered, for an inclusive charge, to stamp and post special envelopes in Brussels, whence they would be carried on the first flight of the new service to Elisabethville, and there to re-stamp and re-post them for the first return flight.

An envelope flown on the Sabena African service.

This, though hardly the quickest way of sending a letter from Brussels to Brussels, provided a flown cover whose postmarks pay tribute to the speed of the service: Brussels, November 15; Elisabethville, arrival 21st and departure 23rd; Brussels arrival, 29th. The cover bears two groups of air stamps, Belgian and Congo, all showing a Trimotor Fokker F.VII in flight.

And there is an amusing story behind that Belgian issue, for the aeroplane on it bears Italian registration letters. It was copied from a photograph of another Fokker, used by Avio Linee Italiane, which appeared in a publication of the Fokker company, and which an artist who evidently did not wish to make the slightest mistake copied so *very* faithfully!

ALEC DAVIS.

HERE and THERE

The British Sikorskis : Petrol from Coal : A Lecture on Sir George Cayley

The British Sikorskis

TOWARDS the middle of this month, an issue of ordinary shares in the new company, British Marine Aircraft, Ltd., is expected to be made. The company has acquired the British rights in the construction of Sikorsky flying boats such as the S.42 type used by Pan-American Airways. A site has been secured near Hamble, with frontage to Southampton Water, and here the intention is to erect a factory for the construction of the boats. The chairman of the board will be Air Marshal Sir John F. A. Higgins, for many years a director of Armstrong Whitworth Aircraft, Armstrong Siddeley Motors, A. V. Roe and Co., and A.S.T. The board will include, in addition, Admiral H. W. Grant, a director of Cable and Wireless, Ltd., and Brigadier General Guy Lubbock, a director of Bankers' Investment Trust, Ltd.

British Marine Aircraft, Ltd., is the first company to be floated by Aircraft Industries Corporation, Ltd., with the object of specialising in the financing and development of approved companies connected with the aircraft and allied industries. The managing director of Aircraft Industries Corporation, Ltd., is Mr. W. A. Phillips, who took control in 1934 of the Yorkshire and Lancashire Corporation, Ltd., and floated the British Aircraft Manufacturing Co., Ltd., as a public company in 1935. Other directors of A.I.C., Ltd., are: Lt. Col. J. T. C. Moore-Brabazon, and Messrs. C. de Lisle Hewitt, Dermot J. Mooney, W. Craven Ellis, and J. Roland Robinson.

It has been stated that orders for flying boats to the value of a quarter of a million sterling are already held by British Marine Aircraft, Ltd., but so far the identity of the customer, or customers, has not been disclosed.

Coal-Petrol Progress

AT the eighteenth annual general meeting of Low Temperature Carbonisation, Ltd. held recently in London, it was stated that their coal-petrol continued to be used by the Royal Air Force and arrangements were now being made to supply this type of fuel for general consumption.

The sales of their various products showed an increase of 14 per cent., and this winter's trade constituted a new record. The works in Yorkshire were carbonising 5,100 tons of coal per week, and were operating all the year round at this figure.

The company had also made a great deal of progress with the preparation of diesel oil from coal. Engine tests were completed, and lengthy road tests were now being undertaken.

Sir George Cayley

BY way of celebrating its seventieth birthday, the Royal Aeronautical Society departed from its normal practice of "Fostering and Developing the Science of Aeronautics" and substituted a paper dealing with some historical aspects of the past, principally with the work of Sir George Cayley. This paper, collected and complied by Mr. J. E. Hodgson (Hon. F.R.Ae.S.), was read by him before the Society last Monday evening, with Mr. C. R. Fairey in the chair.

There must be many who do not realise the extent of the work of Sir George Cayley, "the father of the aeroplane." He was born at Scarborough in 1773. It appears that he made his first experiment with a so-called Chinese flying top in 1792, and his last reference to flying, in his detailed records, was made in 1855—at the age of 83. During the intervening period his experiments, in the light of modern knowledge, were unbelievably advanced. The flying top, in his own words, afforded "a very beautiful specimen of the action of a screw propeller in air . . . capable of the most powerful and extensive application."

Close studies of bird-flight enabled him to form surprisingly accurate ideas on wing loading. In 1804, he started a series of experiments—the first of the kind ever made for purely aerodynamic purposes—with a pivoted form of whirling arm. These led up to his first glider, working on the principle of the inclined plane.

He appeared to be so satisfied with the performance that he spent the most of the following thirty or forty years in search of a means of propulsion. During this period he constructed a glider weighing 561 lb., and loaded with 841 lb., or 2 sq. ft./lb. This, when launched from a hill, sailed downward with varying stability according to the rudder setting. He made several other machines which, incidentally, led him to invent the tension or bicycle wheel as "being the lightest possible for aerial navigation."

In 1808 he began the earliest known experiments on the centre of pressure, with a simpler form of glider. His last contribution to mechanical flight, made in 1853, argued for further experiments on the principle of the inclined plane, to be made by the use of "wing waftage" in order to obtain a "sound, practical basis for calculating the engine power necessary." Sir George also noted the advantages of the air-screw in respect "of its uniform, direct, horizontal pressure," and suggested experiments with an engine using hydrogen or carburetted hydrogen gas as fuel.

An Improved Boundary Light

ON Tuesday evening a new version of the Curren boundary light, which was described in *Flight* last year, was demonstrated at Heston before representatives of the Air Ministry, of Imperial Airways, and others. The new light is pushed over by any pressure greater than 10lb. and the contact is broken.

Story and Pictures

"Flight: The Story of Aviation in Pictures and Text." By Agnes Rogers. (Harper and Brothers, 90, Great Russell Street, London, W.C. 7s. 6d.)

A THOROUGHLY "meaty" publication this, giving the impression that the compiler has gone to extreme lengths to get exactly the material she wanted in order to tell "the story of aviation in pictures and text." The tone is American throughout, and there is a certain liveliness about the captions which permits no flagging of interest and which should make one only too eager to be instructed. In comparison with that of certain other works in the same category, the text is commendably accurate, but, as must be expected when technicalities are to be presented concisely and for popular consumption, the author is prone to make such statements as "retractable landing gear is said to add at least 25 m.p.h. to an airplane's speed." One does not believe, of course, that the Fokker F.22 has "a Pratt and Whitney Wasp Junior motor," or that the performance of the Consolidated P.30 is "unequalled by any foreign plane."

The whole work is well balanced, both in layout and in the amount of space devoted to each subject. H. F. K.

The Deutsch Cup

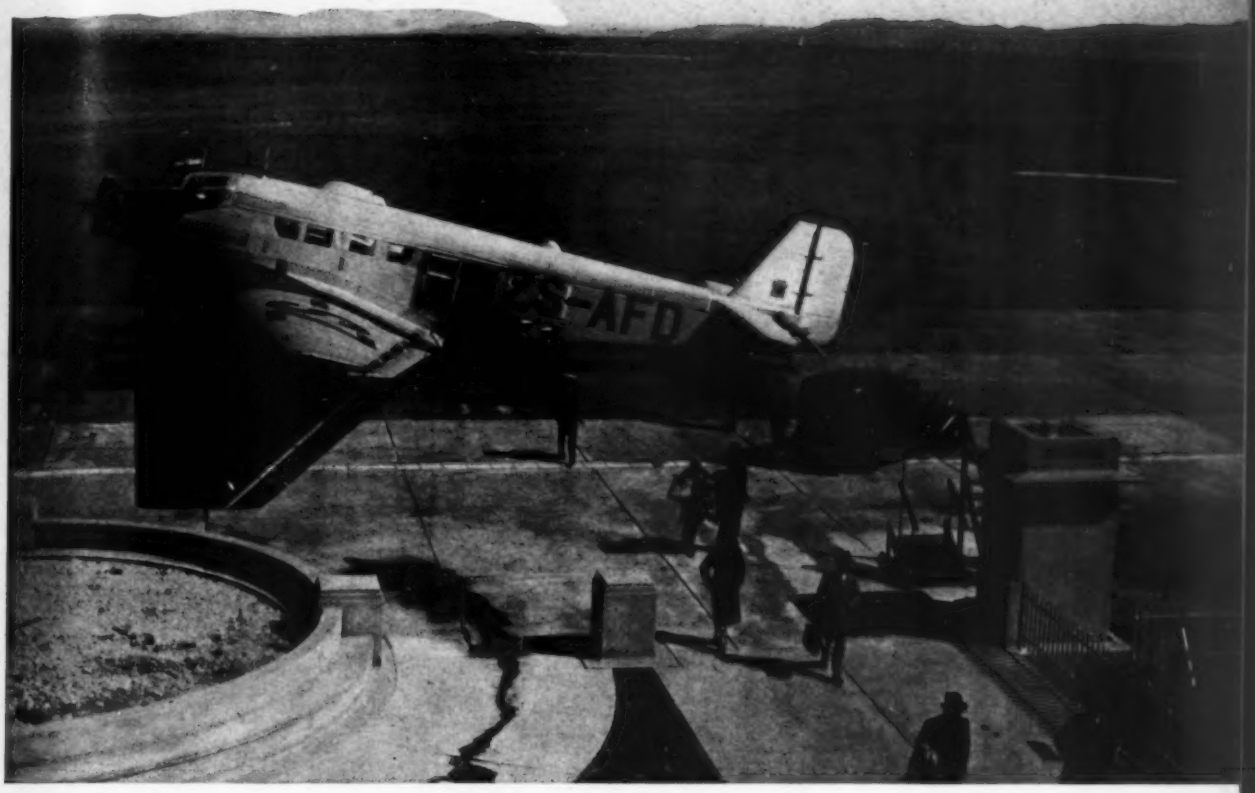
A FEW weeks ago *Flight* pointed out that in view of the large prizes offered by the French air ministry in connection with the 1936 Deutsch Cup it was well worth while for British constructors to enter machines. It was also suggested that, with relatively minor modifications, the Napier Rapier engine could be altered to conform to the eight-litres capacity regulation. As one version of the Rapier is supercharged and already develops about 400 b.h.p., it does not appear unlikely that, in spite of reduced capacity, it could be made to develop that power, or even a little more, for racing purposes. With the small frontal area the drag should be low, and it should be possible to build a machine around it well able to compete against the French entries.

Perhaps it may be of interest to recall the details of the formula upon which is based the French air ministry's offer to purchase the winning machine. This is as follows:—

$$400{,}000 \text{ francs} + (V\text{-}443) \times 7{,}000.$$

In the formula V represents the speed (in km./h.) of the 1936 winner, and 443 is the approximate speed, also in km./h. (275 m.p.h.) at which Delmotte won the contest in 1935. Thus, if the speed of the 1936 winner is 500 km./h. (311 m.p.h.) the offer of the French air ministry will be 799,000 francs. In other words, the offer will be for 400,000 francs, plus 7,000 francs for every km./h. by which Delmotte's speed is beaten, up to a maximum of 900,000 francs.

Should the highest speed of the 1936 contest be lower than that of 1935 no prize will be awarded.



SOUTH AFRICA GOES AHEAD

Airway Development in the Union : British Machines to be Adopted : Eightfold Passenger Mileage Increase in the Past Year

FIFTY years ago a German missionary landed in Durban on his way to a mission station in the Northern Transvaal. He left the port by ox-wagon, and it took him two months to reach the Witwatersrand. Thirty years later, returning from his first holiday overseas, he again landed at Durban, and completed the distance from Durban to Johannesburg in two days by train. Last year he flew over the same route in one of the Junkers Ju.52s now in operation, and arrived at the Rand Airport two hours after leaving the coast.

South Africa has not been slow to realise the advantages of air travel. It is a country of vast spaces and marvellous visibility. From a flying point of view it is ideal. It is not surprising, therefore, that every year sees greater strides being made in the development of civil as well as of military aviation.

When considering the progress which has been made in flying in South Africa, it is impossible to avoid paying a tribute to the pioneering efforts of Major A. M. Miller, who was the first man to give serious attention to the organisation of a regular service between the main centres. He persevered in the face of

The heading picture shows passengers disembarking from a South African Airways Junkers Ju. 52 at the Rand Airport. On the right is an aerial view of the extreme southern end of the African Continent—Cape Point.

(Left) A South African Airways Ju. 52 passing over the wattle plantations of Natal.

(Below) No terrain for forced landings—the Valley of a Thousand Hills, near Durban.

very grave difficulties, and with the aid of only a small subsidy from the Union Government for the carriage of mails. At the end of 1933, however, it was realised that the Union Airways could not continue without very much greater Government support, and an arrangement was reached in February, 1934, by which the assets of the company passed into the hands of the Government, to be administered by the South African Railways and Harbours Administration.

At that time Union Airways owned five Junkers F.13 (four-seaters) and one Junkers W.34 (six-seater), two Puss Moths and one Gipsy Moth. Services were operated three times a week between Durban and Johannesburg, and weekly between Durban and Capetown, calling at Port Elizabeth and East London. The monthly mileage flown at that time was 14,280.

Soon after assuming control, the Government purchased three Junkers Ju.52/3m. machines, with seating accommodation for sixteen passengers. Another aircraft of the same kind, but with slightly greater seating accommodation, has since been added. These aircraft have been operated on the regular routes, the smaller Junkers being sent to South-West Africa. One of them has recently been used to produce a film of S.A. activity.

British Machine

The Government has now, as already reported in *Flight*, placed an order with Airspeed, Ltd., for the delivery, early next year, of seven Envoys. Four of these machines will be used on the feeder services which are being developed, and three of them are intended for the South African Air Force. The machines for South African Airways are being ordered with conversion equipment, by which they can be converted within a short time to military purposes.

In addition to these machines tenders have been called for four ten-seater aeroplanes with a maximum speed of not less than 175 m.p.h. The Minister intended, at first, to stipulate a cruising speed of 200 m.p.h., but decided later to reduce it to enable English manufacturers to compete.

Tremendous progress has been made during the last two years. There is to-day a daily service in each direction between the Rand and Durban, a service twice a week in each direction from the Rand to Capetown (via Durban, East London and Port Elizabeth), and a service once a week in each direction between the Rand and Capetown *via* Kimberley. These lines were indicated in the map of African air routes published in *Flight* of October 31. A satisfactory arrangement has now been reached with the Portuguese authorities for the inauguration of a feeder service between Germiston and Delagoa Bay, and arrangements are being made to introduce one between Germiston and Port Elizabeth, and possibly another on the South-West African route. S.W. African Airways, of course, are now part of S.A. Airways, and a weekly service operates each way between Kimberley and Windhoek, connecting with Imperial Airways service.

An indication of the progress made since 1934 can be obtained from an examination of the following comparative figures:

	Feb., 1934.	Oct., 1935.
Paying passengers carried over single stages	87	979
Machine flights	57	165
Machine-mileage	14,280	52,000
Paying passenger-mileage	33,665	276,732
Mail carried (lb.)	1,891	8,995
Luggage and freight (lb.)	4,705	39,391

South African Airways are now recording a machine mileage of 624,000 miles annually, and this is likely to be greatly exceeded shortly, and still further exceeded when the Government inaugurates its services to Northern Rhodesia as a result of the arrangement reached between the British and Union authorities concerning the flying boat service to Durban.

The regularity of the service in South Africa has been interrupted only when abnormal rains on the coast have prevented the use of the aerodromes—eighteen inches of rain fell in Durban in three days early last year. During the time in which the Ju.52 machines have been operating, only on four flights have machines failed to operate to schedule, three of these being due to very bad weather and one to a burst tyre. Each flight was completed on the following day. South African Airways' efficiency has been over 99 per cent.

Second pilots in the Airways' service start at £450 a year, rising to £600. The commanders start at £650, rising to £850. In addition they are paid for flying time at the rate of twopence a mile. South African Airways policy is to choose as pilots men who have at least 1,000 hours of flying experience.

A. J. F.

THE MILITARY VULTEE

Some Features of a New and Unusually Interesting American Design

(1) A Wright Cyclone of 750 h.p. is fitted to the new Vultee V-11 attack bomber. In this view the cowling has been removed and the exhaust system and several other items are visible.

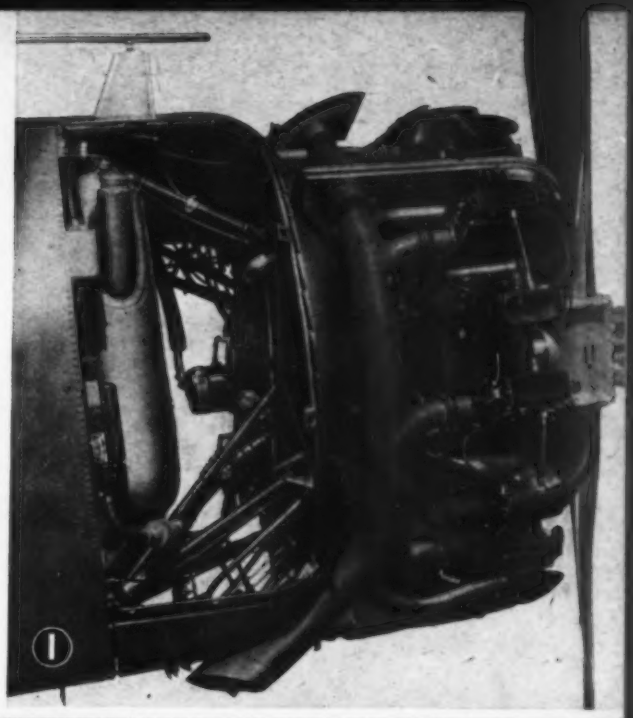
(2) Details of the wing structure and the operating mechanism for one-half of the undercarriage. Retraction is effected either manually or electrically by a system of torque shafts and bevel gears driving a worm and gear quadrant mechanism attached to the upper end of each undercarriage strut.

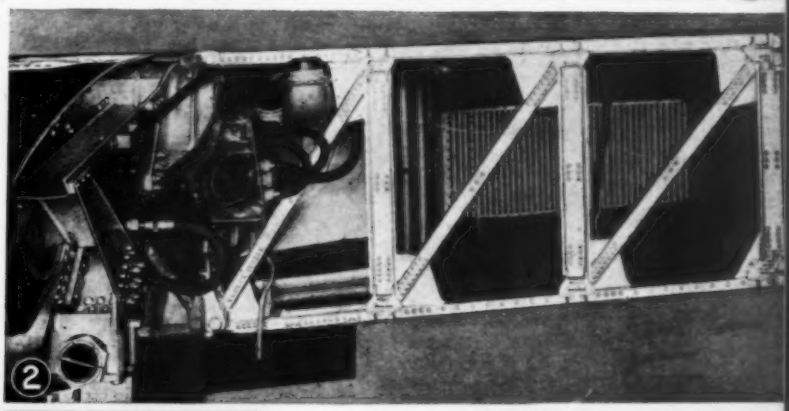
(3) The gunner occupies the rear portion of the long cockpit enclosure. This view shows the mounting for his Browning gun.

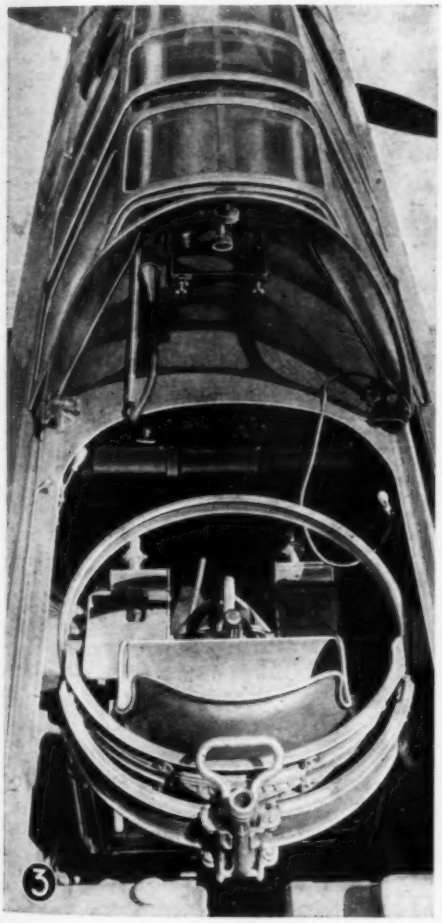
(4) The tail cone and fin structure is a unit removable from the fuselage.

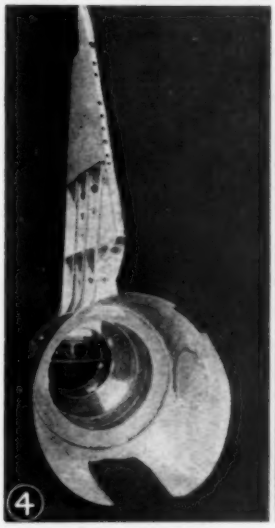
(5) A sturdy inwardly-retracting undercarriage is not the least interesting feature. Shock absorption is obtained by means of oleo legs, rubber taxying pads and air wheels.

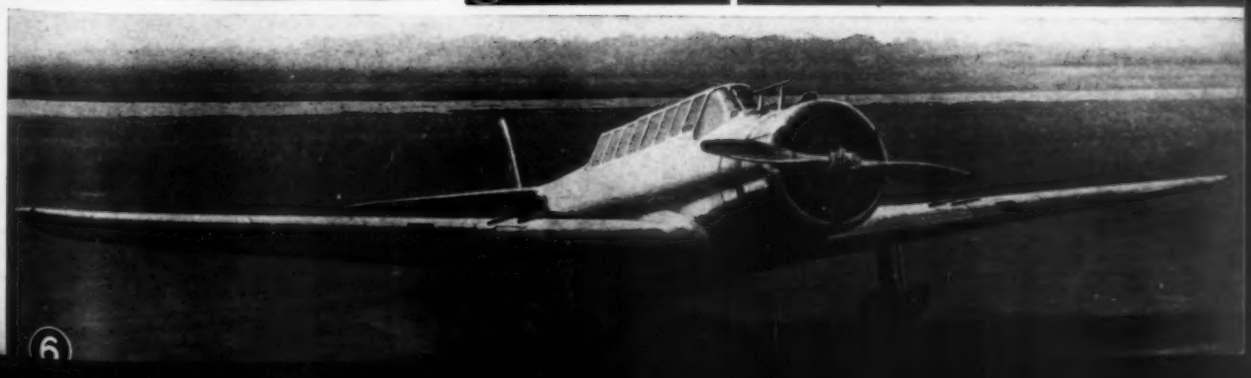
(6) The long "conservatory" is the most striking feature of the machine. Further details appear overleaf.

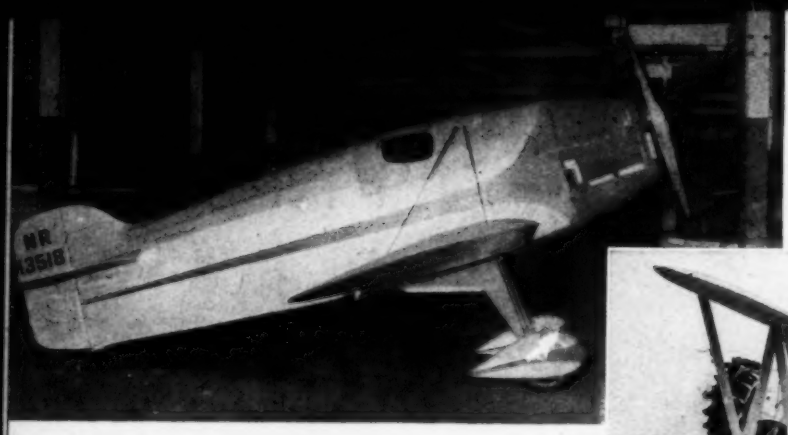












The latest U.S. Navy fighter to go into service is the Grumman F2F-1 shown below. It is powered with a 650 h.p. Pratt and Whitney Twin Wasp Junior.

Certain particulars of the little Rasmussen IIa racer (above) are given on this page. It does 142 m.p.h. on 40 h.p. and will eventually do better than that. (Below) The prototype Consolidated P-30 two-seater pursuit with Curtiss Conqueror engine. The type has been adopted by the U.S. Army Air Corps.

SOME NEW AMERICANS

Contrasted Types, but all Fast : The Vultee V-11 : Consolidated P-30 : Grumman F2F-1 : Rasmussen IIa Racer

VULTEE V-11.—A fairly comprehensive description of the new Vultee attack-bomber monoplane—now, incidentally, known as the V-11—was published in *Flight* of October 31, 1935. Since that date the manufacturers have been subjecting the machine to thorough tests and have lately issued a new set of performance figures. The maximum speed is given as 230 m.p.h. with the Wright Cyclone SR-1820-F53 engine, and the range, as a bomber carrying full fuel load, is 2,200 miles, which is 500 miles less than the original figure—presumably an estimated one.

The V-11, some details of which are revealed on the previous page, is being offered for export, and, so far as is known, has not been adopted by the U.S. Government. It has, nevertheless, a performance superior to that of any comparable machine in use in the U.S. Army Air Corps.

Exhaust Supercharger

Consolidated P-30.—The Air Corps, however, is to receive a large number of what would appear to be extremely efficient two-seater pursuit machines, or what we should know as fighters. The type concerned is the Consolidated P-30, which has a liquid-cooled twelve-cylinder Curtiss Conquerer engine, fitted with an exhaust-driven supercharger mounted on the port side.

No performance figures have been officially released, but a maximum speed of 252 m.p.h. is said to be attained.

During recent years aircraft of the U.S. Army Air Corps have usually been fitted with air-cooled radials, although a fair number of machines in service have the water-cooled or Prestone-cooled Conquerer. The adoption of the P-30 with this power plant might indicate that the pendulum is tending to swing over to that type for certain purposes. The U.S. Navy, of course, makes use of air-cooled engines almost exclusively.

Grumman F2F-1.—One of the most interesting types actually being supplied to the U.S. Navy is the Grumman F2F-1 single-seater fighter (they are "fighters" in the Navy and not "pursuits" as in the Army Air Corps), fitted with a 650 h.p. Pratt and Whitney Twin Wasp Junior two-row radial. This type is said to be extremely manœuvrable, as might be imagined from an inspection of the photograph on this page: it is fast, too, having a retractable undercarriage, cockpit enclosure, and being of generally clean design. The view does not appear to be outstandingly good in certain directions, particularly when it is remembered that the machine is intended for carrier operation.

High Speed on 40 h.p.

Rasmussen IIa.—No one will deny that the little Rasmussen IIa monoplane illustrated above is of striking appearance. Obviously it is not "anybody's" machine and actually is a privately built racing type. Its engine is a 40 h.p. inverted air-cooled four-cylinder in-line type of 1,300 c.c., and, according to a correspondent who is in close touch with Mr. Rasmussen, does 142 m.p.h. It is confidently expected that a different airscrew (the one now fitted was designed for a flat twin) will increase this.

It seems fairly obvious that with the cowling shown, the forward view is bad, but this should improve when a hollow-ground cowling is incorporated. Structurally the machine is of welded steel tubes, excepting the wings, in which wooden construction is employed.

According to the correspondent who has sent these particulars of the Rasmussen, the little Chester monoplane, illustrated in *Flight* of April 25 last year, has passed the 300 m.p.h. mark, using a supercharged Menasco of approximately 200 h.p. And this is in spite of the fact that it has a fixed undercarriage and strut-braced wings!

FOKKER'S NEWEST

A 273 m.p.h. Fighter and a Twin-engined Bomber : Normal Fokker Construction Retained

OF recent Fokker military designs perhaps the most interesting is the D.XXI, a low-wing monoplane single-seater fighter which, with an Hispano Suiza 12 Ycrs engine, is capable of 273 m.p.h. The Bristol Mercury VIS radial is an alternative power plant.

Although its performance is of such a high order its structure follows typical Fokker practice. The one-piece wing is attached to the fuselage by four bolts and has two spruce and plywood box spars. Those materials are used, in addition, for the ribs, and bakelite plywood is employed for covering the structure. Trailing-edge flaps run between the ailerons and fuselage and the ailerons are aerodynamically and statically balanced.

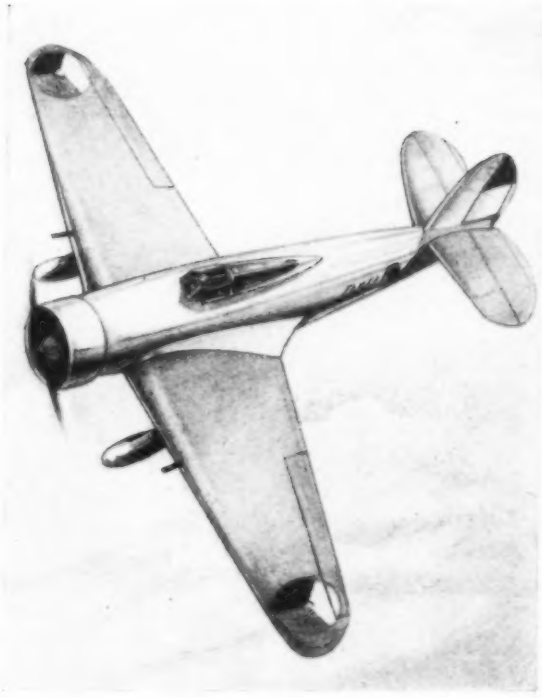
Both rigid and wire bracing is used in the welded steel-tube fuselage, which is covered with metal panels and fabric. In accordance with modern practice, trimming tabs are provided for ailerons and rudder, eliminating an adjustable tail plane. The undercarriage is not retractable, but is a well-faired fixed type embodying oleo-pneumatic shock absorbers and wheel brakes.

An air-cooled or a liquid-cooled engine may be fitted, the mounting being of steel tubes integral with the fuselage. It is necessary when the liquid-cooled unit is installed to place the fuel tanks in the wings between the spars, but with an air-cooled engine the main tank is in the fuselage and an auxiliary tank may be slung between the spars below the fuselage.

Three Guns

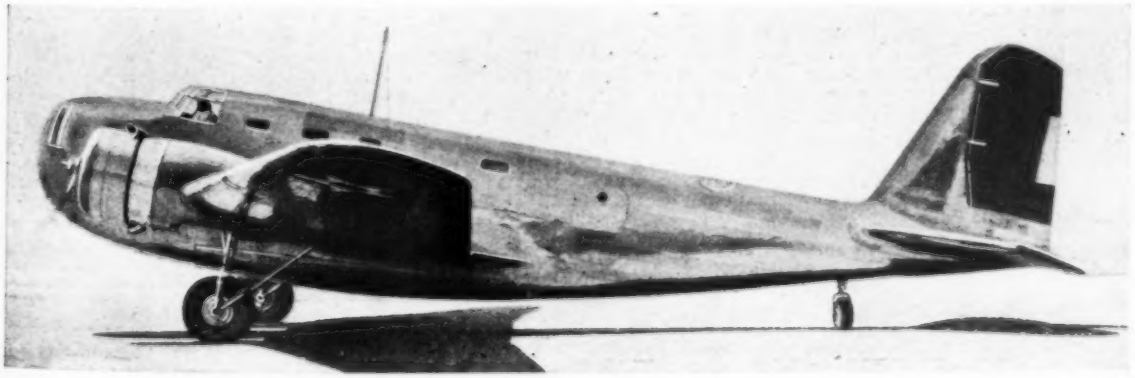
The pilot is provided with a cockpit enclosure which incorporates an emergency exit in the roof, and he has, in addition, a panel in the floor permitting downward vision. When the air-cooled engine is fitted the normal armament comprises a synchronised machine gun of 0.5 in. calibre mounted in the fuselage and a pair of rifle-calibre wing guns, the latter being adjustable in the air. The Hispano Ycrs engine, of course, is provided with a 20 mm. *canon* which fires through the airscrew boss and replaces the large-calibre machine gun.

Empty and loaded weights with the 645 h.p. Bristol Mercury and the 860 h.p. Hispano Suiza Ycrs engines are, respectively, 2,695 and 3,850 lb. and 2,970 and 4,158 lb. With the Hispano the wing loading is 24.2 lb./sq. ft. Maximum speeds are 273 m.p.h. at 13,120 ft. with the Hispano and 245 m.p.h. at 15,500 ft. when the smaller Bristol radial is used. The range with the Mercury is 560 miles, which is 32 miles better than with the Hispano. A ceiling of 32,800 ft. is reached with the French engine.



The Fokker D.XXI fighter seen in this *Flight* sketch has a radial engine, but the liquid-cooled type, such as the 860 h.p. Hispano Suiza Ycrs *canon* engine may be fitted. With that power plant a speed of 273 m.p.h. is attained.

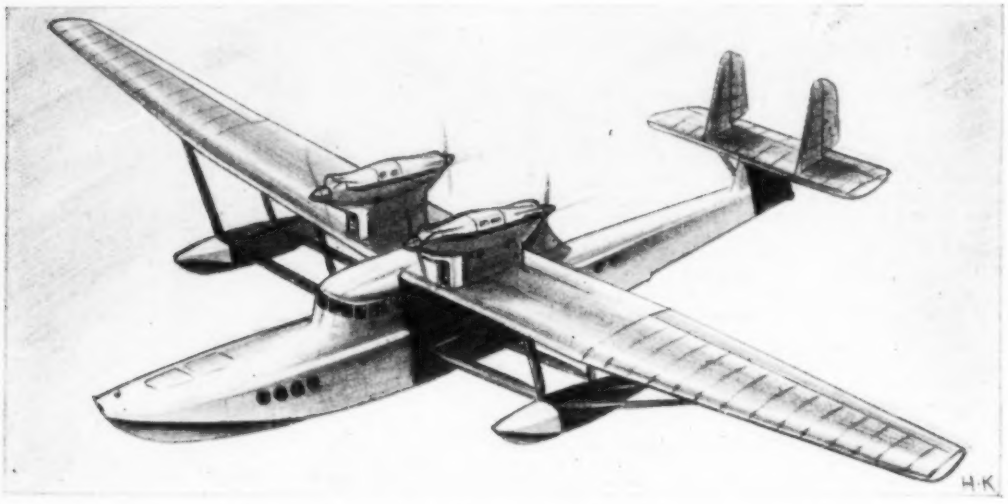
The Fokker T.V, another new Fokker type, is a twin-engined bombing and reconnaissance type with a semi-high cantilever wing. It, too, is of orthodox Fokker construction, but has landing wheels which retract into the tails of the engine nacelles, which may house Rolls-Royce Kestrel, Gnome Rhone Mistral Major or Hispano Suiza Y type engines, among other makes. A revolving turret is provided for the nose gunner. The pilot sits in front of the leading edge of the wing behind which there are two guns, one above and one below the fuselage. Two Hispano Suiza Ydrs engines of 860 h.p each give a maximum speed of 245 m.p.h. at 13,120 ft. Carrying a 1,980 lb. bomb load (including racks) the normal range is 540 miles, but tankage may be provided for 870 miles.



A DOUGLAS BOMBER. This is the high-speed, long-range Douglas entered in the U.S. Army Air Corps competition with the ill-fated Boeing 299 and the new Martin. It bears resemblance in certain features, notably the undercarriage, to the D.C.2 commercial machine. Reference is made to this machine in the article "The Big Bomber To-day" on pages 32-35. Note the deep "belly" for the bombs.

COMMERCIAL AVIATION

— AIRLINES — AIRPORTS —



THE TRANSATLANTIC LOIRE. This *Flight* sketch gives some idea of the appearance of the Loire 102 flying boat being built for the French South Atlantic service. It should be flying by April and is being fitted with four Hispano series X twelve-cylinder water-cooled engines of approximately 700 h.p. each. The cruising speed should be close to 165 m.p.h. with four passengers, 1,430 lb. of mail and fuel for a range of 2,640 miles.

THE WEEK AT CROYDON

Two Promotions and a Return : A Fine Gesture : The Homing Balloon : Rainmakers

IN these days when there is a shortage of pilots of the captain class on most of the big European air lines it is good to hear of promotions from the rank of acting-captain to that of captain. Last week Imperial Airways announced two such promotions for Messrs. Holmes and Wilkins.

Amongst those who have not been seen at Croydon for some time is Capt. Armstrong, of Imperials, one of the oldest civil air pilots. He returned just before Christmas (as a mere passenger!) on the I.A. service from the East. He it was who opened up the line Penang to Hong-Kong, which will eventually be an important link in Empire air routes.

That extremely active and mentally youthful lady, Miss M. E. Brook, whose age, she says, is nobody's business but her own, recently returned from her trip to Nairobi by Imperials. She left Croydon on the African mail with exact punctuality, and arrived the other day at Croydon only one minute late. She had an excellent trip, nobody being anything but perfectly fit and well either while going out or coming back, which shows how very much we have advanced in the matter of air sickness. Presently air sickness may be altogether eliminated, but *mal de mer*, it would seem, is little less prevalent than it was around the time of the Spanish Armada and all that. Miss Brook's next trip, she says, will be to Cape Town.

That enterprising ex-member of the Croydon fraternity, Man Mohan Singh, has just performed a feat which proves to the world that he is the fine fellow his friends at Croydon always knew him to be, and which has been both generous and kindly as well as being of great use to civil aviation. After he left Croydon on August 12 in an attempt on the Cape record, he reached Khartoum ahead of schedule, but bad luck overtook him, and he finally wrote off his Gull when taking off from Luwingo, Northern Rhodesia. Later, he bought a Puss Moth at Elizabethville, flew it back to Luwingo, and from there made leisurely progress to Cape Town, stopping at many places on the way to give free joy rides to kiddies, both Indian and European. A Durban paper remarks that Singh and his two Indian companions have done what no European pilots have yet done (in that part of the world anyway), and brought to 1,500 children their greatest moment.

Something to Remember

"No doubt," says the newspaper, "the airmen were officially thanked, but the really imperishable thanks subsist in the remembering hearts of hosts of little ones to whom airmen and planes will long be a waking dream too glorious to be released from the clutched grasp of recollection." That is well said. Croydon probably feels the same, but, being British and "largely inarticulate," merely remarks "Good show, Singh!" and collapses, abashed at its own verbosity.

At about the time a Spatted Eagle escaped from some zoo or other, the instrument-bearing balloon, now used by the Croydon weather wizards for taking the temperature, humidity, and what not during fog, also made a bid for freedom. There is no truth in the rumour that some confused but convivial gentleman, aware of both escapes, rang up the Croydon Met. Office after dinner one evening to say that "your Spatted Baboon is perching on our front garden shrub." As a matter of fact, the balloon, apparently fitted with a homing device, did better than the eagle, for it finally came to rest practically outside the palatial front door of the chief met. officer's private residence.

Met. people have an unhappy time during periods of

prolonged rain, since people seem inclined to hold them as personally responsible, and I heard it suggested that they might do something in the same way as the African rain-makers, who employ synthetic magic to produce rain. To reverse the procedure, all that would be necessary to stop the floods would be for the Met. staff to walk around in duck trousers and straw boaters mopping their brows and complaining of sunstroke.

British Continental Airways state that on all lines their freight figures have increased 150 per cent. in between November and December or over—which is good going for winter time on newly opened routes.

There is something remarkably festive about a notice to radio operators which was issued by Air Ministry on December 31. It starts: "There is a tendency for trailing aerials to whip and to spin round in circles during reeling in and out, and this tendency is greatly increased if the reeling is effected rapidly or in a jerky manner." If for "trailing aerial" you read "trainee aeronaut," you will see what I mean.

A. VIATOR.

In South Africa

AERODROMES in the Union are being rapidly improved. The new Rand Airport, which was recently opened, is almost as perfect as it is possible to make it, and the Greater Baragwanath Aerodrome in Johannesburg was opened by the Minister of Defence at the end of November. The Government has now embarked on a policy of arranging emergency landing grounds at fifty-mile intervals along all routes, and within the next few weeks the wireless triangulation of the Union will be complete. Free insurance up to £1,000 is allowed every passenger.

New Equipment for British Airways

AIRWORK Sales Department has received an order from British Airways for four new De Havilland 86a four-engined air liners, in connection with the latter's 1936 expansion programme. These machines will be fitted with Gipsy VI engines of the new Series II type, rated to give a higher continuous power output than the standard type, and enabling full advantage to be taken of the benefits of the De Havilland controllable-pitch airscrews which are to be used. Airwork has taken in part exchange a fleet of D.H. Dragons and Dragon Rapides, which will shortly be placed on the market extensively equipped, reconditioned and complete with twelve months' C. of As.

Welcoming the New Year

WHILST the New Year was being ushered in, Air Dispatch's Avro 642, carrying a party of sixteen, cruised over London's revelry. A special loud speaker was installed in the cabin, and the strains of dance music improved the occasion.

New Year's Eve was a busy day for the Avro. Earlier she had carried the ice-hockey team to Paris for an important match, and, after seeing the New Year in, continued carrying passengers for joy-rides over London until 3 a.m. Two hours later she was well on her way to Paris again with the newspapers.

Air Dispatch's £3 3s. return winter excursion trips to Paris have become extremely popular, and more than half the bookings have come from the Midlands and Northern England.

Across the South Atlantic

ON Friday evening of last week the "all-air" South Atlantic plans of Air France were suitably sealed with a cocktail party at Quaglino's. In all, fifty-seven experimental crossings have been made—fifteen by Capt. Jean Mermoz—and Air France now feel justified in instituting a 100 per cent. air-borne mail service from London to the Pacific coast.

Letters posted at the G.P.O. up to 11.45 a.m. on Saturday will reach South America on Tuesday and Santiago on Wednesday.

Presently, it is hoped, passengers may be carried, and the most likely machine for this purpose is the Loire 102 flying boat, which is now nearing completion. This all-metal machine will be able to maintain a height of 9,000 feet with one motor out of action and the engines, in any case, can actually be serviced while the machine is in the air.

It is interesting to remember that, in addition to the three-engined Couzinet landplane, *Arc-en-Ciel*, four specially built machines have been used for the South Atlantic service. These are the Latécoère boat, *Croix-du-Sud*, the Bleriot *Santos-Dumont*, the Farman monoplane, *Centaur*, and, lastly, the *Ville de Buenos Aires*, a sister ship to the Latécoère, which was used for the first time this Christmas. Each of these machines has four engines.

As already announced in *Flight*, the big Latécoère, which has recently flown to the Windward Islands, is expected to be used for an experimental North Atlantic crossing, via the Azores and Bermuda, in April.

Ards Changes

AS from January 1, Lord Londonderry, who already owned the Ards Airport, Belfast, has taken over its entire management from Airworks, who were formerly managers on his behalf. This step involves for the present no changes in staff, but plans are on foot for the formation of a local flying club in the place of the existing branch of the Airwork School of Flying, which, after sixteen months' successful operation, is to be closed down.

Traffic Increases

CROYDON passenger figures for the year 1934 were 118,000 by all air lines. Heston carried 17,903 inward and outward passengers, and British airports, as a whole, carried 135,100, which means that without Croydon we should be in a poor way, and without Croydon and Heston we should be practically non-existent. Query: If other airports were at all properly equipped, would there be traffic?

Incidentally, the K.L.M. bulletin also gives some interesting passenger figures. While 21,327 people were carried by them in 1932, 47,701 were carried in 1933, 85,969 in 1934, and more than 100,000 in 1935.

The Nigerian Extension

IT was expected that, early this year, Elder's Colonial Airways would open the first section of the proposed route between Khartoum, Kano, Lagos, Accra, Kumasi, and Freetown, using D.H.86 machines. However, the necessary steps have not yet been taken to clear the aerodromes and surroundings of the mosquitoes which carry fever.

This measure is necessary if the service is to comply with the rules of the International Sanitary Convention and will, in any case, minimise the risk of service interruption at a later date. The first services, incidentally, will reach Kano and the line will be extended to Lagos during the year. Freetown, it seems, is still in the nature of a pious hope, though there is little doubt that the service will eventually reach its logical terminus.

The Mediterranean Tragedy

ALL but two mail bags had, it appeared been recovered from the Short Calcutta, *City of Khartoum*, by last Monday evening.

The boat was lost on the evening of the last day of the old year. Nine passengers and three members of the crew lost their lives, the only survivor being the pilot, Capt. V. G. Wilson, who was picked up by H.M.S. *Brilliant* after swimming for five hours. The facts that he was an extremely good swimmer and that the Calcutta has an open cockpit must have contributed, in no small measure, to his survival.

Until the findings of the official enquiry are made public it is only possible to guess at the cause of the disaster, which was the first fatal one for the Imperial flying boat fleet since the loss of the Calcutta in the Gulf of Genoa in October, 1929. There appears to be some doubt, however, whether through shortage of fuel or from some other cause, the three engines did actually cut out when the machine was only two miles from Alexandria. In the dark, the pilot may have glided into the sea or held off too high and stalled. The boat was an hour and twenty minutes overdue, and this period would possibly be long enough to exhaust the fuel reserve.

It is of interest to note that, since the loss of the Avro Ten in December, 1933, Imperial Airways have carried 129,000 passengers and flown 6,800,000 miles. Lord Swinton sent a message of sympathy to Sir Eric Geddes, and he has, in turn, received sympathetic messages from the French Air Minister and from the Dutch Minister of Public Works.

Meanwhile, the Calcutta which has been used for flying boat training at A.S.T. during the past month has been flown to Alexandria to replace the *City of Khartoum*.

Commercial Aviation

HESTON'S YEAR OF DEVELOPMENT

Traffic Control : The Lorenz Equipment : Landing Area Extensions : New Buildings Big Passenger Increases : Some Interesting Figures

TREES show their age by adding rings to their girth, small in lean times and large in fruitful years. Seven years have left their mark upon the Heston tree, and the last has been the greatest. 1935 has seen the Airport's most important building extensions and developments.

The growth of airline operation made it necessary, early in the year, to provide full airport control, wireless communication and improved passenger-handling facilities. The control system, which came into force on April 15, was initially handled by the owners of the airport, but the vesting of such authority in a private enterprise was, however, clearly not an ideal permanent arrangement, and on November 11 traffic control was assumed by the Air Ministry, centralising under one authority the traffic of London's two leading airports.

Radio Facilities

Wireless communication and D/F facilities, inaugurated at the same time, have been operated by the Air Ministry since their inception, and as many as ninety-four machines have been directed by wireless in the course of the busiest days. Airwork is, however, itself responsible for the most outstanding wireless undertaking of the year, the installation, now in process, of the international Lorenz blind-landing system, which is intended eventually to effect the safe approach and landing of suitably-equipped aircraft in conditions of zero visibility. The Heston installation, the first of its kind in England, will be an important step towards removing flying's greatest danger—the effect of bad visibility.

The requirements of blind landing, in particular, have led to the extension of the landing area from 105 to 172 acres, a work which was put in hand in 1935 and which will eventually provide runways of from 1,015 yards to 1,315 yards in all directions.

Airline traffic demanded the construction of a large hangar to house passenger aeroplanes, and the extension of the traffic hall, completed early in 1935, which involved the removal of the flying school offices to a new wing of the clubhouse.

The Big Hangar

Finally, the increased turnover of the service department, and of the company in general, led to the construction of a workshop and office hangar which is believed to be the largest building of its kind in England. It has an unobstructed entrance 200 feet wide, capable of admitting aeroplanes considerably larger than any at present used in England. The company's offices have been removed to the upper part of this building, which embraces the whole of the Heston repair and overhaul business, with its subsidiary departments.

On the business side, two notable steps have been taken. One was the adoption by Airwork of a sales policy, and the other was the formation of a civil flying training school at the new Perth municipal aerodrome, in connection with the R.A.F. expansion scheme. This school will start activities on January 27, and Airwork will, in addition, act as managers of the Perth aerodrome (which will be open to other traffic) on behalf of the Perth Corporation.

33,962 aircraft take-offs or landings have been recorded in 1935, during the controlled period between 8.00 hours and 20.00 hours daily. Of these, 49 per cent. were by commercial aircraft. An exact record was not kept in the early months of 1934, but 15,245 aircraft movements were recorded in the last six months of that year. This compares with 17,954 in the same period of 1935—an 18 per cent. increase. 17,903 passengers passed through Heston on the regular air lines in 1935. Again, exact records were not kept in the early part of 1934, but a generous estimate for that year would be 14,000. This year's increase is therefore approximately 28 per cent.

8,668 passengers were carried on Jersey Airways' services, and this figure does not include their Southampton traffic, which represents by far the largest proportion of that company's activity. Their Heston traffic alone shows a 24 per cent. increase on last year's figures. A notable development of the year was the replacement of their existing fleet of D.H. Dragons by D.H.86s and Dragon Rapides.

Spartan Air Lines resumed operation at Heston (after a year at Croydon) on April 14, 1935. Since that date they have carried 4,874 passengers on their Isle of Wight services. Of these, 1,668 passengers were carried in the month of August alone.

Portsmouth, Southsea and Isle of Wight Aviation, which operated services from Heston to the Isle of Wight in the summer months only, carried a total of 41,938 passengers in their financial year. Of these, 1,654 were carried on the Heston services. All services will be resumed in April.

The Blackpool Service

United Airways, which commenced operation between Heston, Liverpool, Blackpool and the Isle of Man in May, 1935, carried 1,216 passengers during the year. In October, the service was extended thrice weekly to Belfast, and in December the company's London terminus was moved to Abridge as a result of the British Airways merger scheme.

The Inner Circle air line, operated between Heston and Croydon in the summer months, carried 974 passengers. The remaining air line passengers making up Heston's total were carried by the B.A.N.C.O., which closed down in April, and by North Eastern Airways, which operated a line Heston-Leeds—Newcastle—Edinburgh between April 15 and the end of July.

Birkett Air Service carried out approximately 25 per cent. more flying in 1935, its total mileage being over 137,000. Two new aircraft, a Miles Merlin and a Leopard Moth, were acquired during the year.

Air Commerce which was formed in December, 1934, using one Puss Moth, is now equipped with two Monospars and two Leopard Moths. It has acquired a considerable following in Fleet Street in the course of a successful year.

Specialising in "fly-yourself" hire, Air Hire has acquired three new aircraft, a Miles Falcon, a B.A. Eagle and a Gipsy I Moth in the course of the year. Considerable mileage, in England and abroad, has been covered with Air Hire's machines, on which one client has flown nearly 300 hours. Bookings for 1936 include two aeroplanes which are to be flown to Africa in March.

British-American Air Services have operated special services to race meetings and important events throughout the last nine months of the year. An extended programme is contemplated in 1936.

SIR ALAN COBHAM'S REFUELLING RESEARCH

RECENTLY it became known that Sir Alan Cobham intended to retire from the business of selling airmindedness to the general public. The story went around that Mr. C. W. A. Scott had purchased from Sir Alan National Aviation Displays, Ltd. That is not altogether correct, the facts being that Mr. Scott has bought some of the aircraft used in the two "circuses" which Sir Alan has had touring the country. The rest of the equipment, barring a few trifling items, has been disposed of to various purchasers.

Sir Alan Cobham feels that his mission as a professional propagandist has now reached the end of its usefulness, and in truth he and those who have worked with him have done much to bring the general public to look on flying as a very ordinary business after all. There can be no doubt that the strain of looking after the organisation of an undertaking of the magnitude of National Aviation Displays must have been very great, and few will deny that Sir Alan—with, of course, Lady Cobham, who has been his invaluable helper—has thrown himself wholeheartedly and with all his immense energy into the task.

For the present Sir Alan proposes to take things a little more easily. That is not to say, of course, that he will be idle. That would simply be impossible for Sir Alan, but his various directorships, in concerns such as Airspeed, Ltd., and R. K. Dundas, Ltd., will claim quite a good deal of his time. Furthermore, at Ford aerodrome, Sussex, Sir Alan will continue in real earnest his experiments with refuelling in the air. It is understood that the Air Ministry and Imperial Airways are interested in these experiments, and some important developments may be expected.

Helping the Prospective Air-line Operator to Choose His Fleet : A Simple Formula Which Takes into Account Speed, Power and Cost Per Passenger

By E. N. B. BENTLEY, A.F.R.Ae.S.

(*Flight* photograph.)

ASSESSING "COMMERCIAL EFFICIENCY"

THE business man who intends to run an air transport company on a commercial basis is not directly interested in such things as percentage structure weight, the relative merits of fabric or stressed-skin covering, and so on. He wants to know the income and expenditure account; how many paying passengers the aeroplane can carry, and how much it will cost to carry them. The technical marvels by which these results are achieved, however much the aeronautical community may admire them, are taken as a matter of course.

Almost all the expenses of operating an air line are dependent on the type of aeroplane used, and what the air-line manager wants is a convenient method of comparing the various aeroplanes on the market. His choice will, of course, vary according to the operating conditions on his proposed air route. A short ferry service over the sea or an estuary will be most efficiently operated by a type of aeroplane different, for example, from that required for a long-distance air route over high mountains. But when he has decided on the general requirements of his particular case, he wants to be able to compare the merits of the different types of aeroplane which appear suitable. The ratio of income to expenditure is the important factor from the operators' point of view, and I will call this the "Commercial Efficiency" of the aeroplane.

Income, broadly speaking, means passengers, because very few air lines rely entirely on mail or goods, and in any case passenger accommodation can always be converted to the less exacting demands of letters and parcels. But the number of passengers carried is not the only thing by which the efficiency of the transport aeroplane is to be assessed; speed is also very important. A fast aeroplane may be able to make two journeys, carrying a load of paying passengers, in the time that the slow one makes one journey. This is not so unlikely as it seems, and it does not mean that the fast aeroplane must be twice as fast as the slow one, as the following example will show. An aeroplane flies 300 miles at a cruising speed of 100 m.p.h. against a head wind of 30 m.p.h.; the average speed over the ground is 70 m.p.h., and the time taken is just over 4¼ hours. The aeroplane which can cruise at 170 m.p.h. under the same conditions has an average speed over the ground of 140 m.p.h., and therefore does the journey in half the time of the slower aeroplane.

The advantages of the fast aeroplane are that it is much less handicapped by adverse weather conditions, and can often do one more stage in the day, carrying its load of paying passengers (the important point) than the aeroplane with the low cruising speed. This means fewer cancellations of service and a better adherence to the time-table, both of which points make for a more popular service. From the point of view of income, the efficiency of the aeroplane must therefore be considered to be proportional, not to capacity, but to passenger-miles per hour.

The item on the other side of the balance-sheet, namely, expenditure, is divided into two main parts: Standing charges, which are not affected by the amount of flying done, and running charges, which depend on the number of hours flown. In actual practice it will be found that the running charges amount to about twice the standing charges for the year. This is, of course, only an approximate figure, and if an exceptionally big mileage is done the proportion will be higher; conversely, if the rate of obsolescence is high, the proportion will be lower.

The standing charges are the insurance of the aeroplane and the obsolescence charges. If the aeroplanes are going to be replaced by new ones every four years, then the obsolescence rate is 25 per cent.; if they are replaced every five years, then the rate is 20 per cent. Both the insurance and the obsolescence charges are proportional to the cost of the aeroplane, and are independent of the speed. The Commercial Efficiency of the aeroplane, with respect to the standing charges, can be expressed by the ratio: passengers carried per £1,000 cost of the aeroplane.

The Formula

The running charges consist almost entirely of fuel and maintenance costs, which are proportional to the total horse-power of the engines. The Commercial Efficiency of the aeroplane relative to the running charges is expressed by the ratio: passengers carried multiplied by the speed of the aeroplane (i.e., passenger-miles per hour), divided by the total horse-power of the aeroplane.

The prospective air-line operator has therefore a simple formula which will give him the relative Commercial Efficiency of the aeroplanes which he is considering:—

$$\frac{P \times V}{HP} + \frac{P}{£}$$

where

P = number of passengers carried.
V = top speed in miles per hour.
HP = total horse-power.
£ = number of thousands of pounds which the aeroplane costs.

I have worked out the Commercial Efficiency of several aeroplanes by this formula, and it will be seen that the first term (running charges) is about twice the second term (standing charges), which shows that the formula also gives the correct proportion between the two charges.

Before looking at the results obtained from this formula

it is necessary to know something about the assumptions on which it is based. The number of passengers carried is the number which can be carried on ordinary air-line work when the aeroplane is also equipped with luggage and lavatory accommodation. Top speed is used in preference to cruising speed, because it is a definite quantity, whereas cruising speed is interpreted in so many different ways, and can be varied (within limits) to suit the conditions. A high cruising speed, for example, can be obtained by running the engines at a high proportion of their maximum output, but this necessitates more frequent overhaul and a shorter life for the engines. The horse-power is the total rated output of the engines in the aeroplane.

Obtaining the Comparison

In the table shown I have included only those aeroplanes of which I have been able to find out the price, because the total value of the Commercial Efficiency depends on this as well as the other factors. In cases where the price is not known it is possible to compare different aeroplanes, using the first term of the formula only; and, as this term forms a big proportion of the total, it will give a reasonably good comparison, unless the price of the aeroplane is exceptionally high or low.

One of the most noticeable things about the aeroplane, compared with other means of transport, is its speed, and so many people are inclined to judge aeroplanes by that alone. In my opinion, Commercial Efficiency is a much fairer basis of comparison for transport aeroplanes, and the table I have given shows the relative merits of the aeroplanes in an order very different from the popular estimate based on speed alone.

Finally, let me say that this article is not intended as a defence of the slow aeroplane. I am not one of those who believe that high-speed transport must necessarily and inevitably cost far more than medium speed. And calculations on some other aeroplanes will show that a low cruising speed does not necessarily mean high Commercial Efficiency.

Although the British aeroplanes quoted are not quite so fast as the Americans, they cannot be called slow, and there are being built in this country at the present time several really fast transport aeroplanes, which will probably show just as good figures of Commercial Efficiency as the existing aeroplanes.

Aeroplane.	Total H.P.	Price.	Top Speed m.p.h. (V)	No. of Pass. (P)	H.P. per Pass.	$\frac{P \cdot V}{HP}$	$\frac{P}{£}$	Commercial Efficiency.
D.H.86 (4 Gipsy VI)	760	£9,000	173	12	63.3	2.730	1.333	4.063
Airspeed Envoy (2 Lynx IVc)	446	£5,115	174	6	74.3	2.340	1.173	3.513
Lockheed Electra (2 Hornets)	900	£10,100	207	10	90.0	2.300	0.990	3.290
D.H.89 (2 Gipsy VI)	380	£4,500	160	5	76.0	2.105	1.111	3.216
Douglas D.C.2 (2 Cyclones)	1,420	£17,000	210	14	101.5	2.071	0.986	3.057
Avro 652 (2 Cheetah VI)	580	£6,250	195	6	96.7	2.015	0.960	2.975
Boeing 247.D (2 Wasps)	1,100	£12,500*	200	10	110.0	1.818	0.800	2.618

* The price of the Boeing is an estimate based on the size of the aeroplane relative to the Douglas, which is of similar general layout.

A COMET'S DESCENDANT

PERHAPS it may be remembered that in a lecture given shortly after the England-Australia Race, Capt. G. de Havilland referred to the possibility of building a "scaled-up" Comet, which could be made into a very efficient commercial aeroplane. It was almost a foregone conclusion that sooner or later the De Havilland Company would design and build such a machine as that foreshadowed by Capt. de Havilland. Work on the design of a new high-speed transport aeroplane has now begun at Hatfield, and although it somewhat resembles the Comet, the new type differs in very many respects, apart from size, from the famous winner of the England-Australia Race.

For one thing, the new monoplane will have four engines instead of the Comet's two. The engines themselves will be of a new type, and it seems likely that they will be inverted vee air-cooled, with twelve cylinders. In view of the great success attained with the Gipsy Six engine, it is, perhaps, not unnatural to assume that the new engine will have similar cylinders. As the Gipsy Six delivers at least 200 h.p., it may be estimated that the new engine will be of somewhere in the neighbourhood of twice that power at least. It may also be taken for granted that gearing and the ability to take controllable-pitch airscrews will be incorporated in the design.

NEW YEAR HONOURS

The following names, which occur in the list of New Year Honours, will be of special interest to readers of *Flight*:—

VISCOUNT

TRENCHARD, Marshal of the Royal Air Force Hugh Montague, Baron, G.C.B., G.C.V.O., D.S.O., D.C.L., LL.D., lately Commissioner of Metropolitan Police.

KNIGHT BACHELOR

SHELMERDINE, Lieutenant-Colonel Francis Claude, C.I.E., O.B.E., F.R.Ae.S., Director-General of Civil Aviation, Air Ministry.

K.C.B. (Military Division)

BOWHILL, Air Marshal Frederick William, C.B., C.M.G., D.S.O., Royal Air Force.

BURNETT, Air Marshal Charles Stuart, C.B., C.B.E, D.S.O., Royal Air Force.

C.B. (Military Division)

CAVE-BROWN-CAVE, Air Vice-Marshal Henry Meyrick, D.S.O., D.F.C., Royal Air Force.

GILL, Air Commodore Napier John, C.B.E., M.C., Royal Air Force.

C.B.E. (Military Division)

HOWE, Group Captain Thomas Edward Barham, A.F.C., Royal Air Force.

O.B.E. (Civil Division)

STEVENS, Herbert Lawrence, Esq., F.R.Ae.S., Principal Scientific Officer, Air Ministry.

M.B.E. (Civil Division)

BARRACLOUGH, Captain Sydney, Education Officer, Grade III, Air Ministry.

WHITE, William Arthur John, Esq., Superintendent, Headquarters, Royal Air Force, India.

THE ROYAL AIR FORCE

SERVICE NOTES AND NEWS — AIR MINISTRY ANNOUNCEMENTS

HEAVILY ARMED: A fine *Flight* photograph of the Gladiator four-gun fighter (Bristol Mercury VIII). The Gloster works are now getting busy on a large order for this excellent machine.

A ROYAL PROMOTION

The Air Ministry announces:—The undermentioned promotion is made with effect from January 1, 1936:—

Air Vice-Marshal to be Air Marshal.

His Royal Highness Albert Frederick Arthur George, Duke of York, K.G., K.T., G.C.M.G., G.C.V.O., Personal A.D.C. to the King.

REWARDS FOR GALLANTRY

The *London Gazette* announced the following awards to members of the Royal Air Force who took part in the Mohmand operations:—

Distinguished Flying Cross to F/O. William Donald Anderson.
Distinguished Flying Medal to L/A. Bertram Alfred Dorrell.

AWARDS

The King has been graciously pleased to approve of the following awards to the undermentioned officers and airmen of the Royal Air Force:—

Awarded the Air Force Cross

Sqn. Ldr. Adrian Henry Paull.
Flt. Lt. Claude McClean Vincent, D.F.C.
Flt. Lt. Edward George Honeywood Russell-Stracey.

Awarded the Air Force Medal

351317 Flt. Sgt. William Wallace.
362998 Sgt. (Pilot) John Harry Tee.

FLYING ACCIDENT

The Air Ministry regrets to announce that F/O. Conrad Charles Francis and No. 365650 Cpl. Herbert James Bryant, lost their lives as the result of an aircraft accident which occurred near Nairobi on December 29, 1935. F/O. Francis was the pilot and Cpl. Bryant the passenger of the aircraft.

AN ORDER FROM AUSTRALIA

We understand that the Australian Government has decided to adopt the Avro general reconnaissance Anson and is placing an order.

No. 2 MECHANICAL TRANSPORT STORAGE UNIT

No. 2 Mechanical Transport Storage Unit formed at Kenley on December 2, 1935. The postal address is: No. 2 Mechanical Transport Storage Unit, Kenley, Royal Air Force, Whyteleafe, Surrey.

ELECTRICAL AND WIRELESS SCHOOL—OFFICERS' REUNION DINNER

The annual reunion dinner of the officers of the Electrical and Wireless School will be held at the Royal Air Force Club, 128, Piccadilly, W.1, at 7 p.m. for 7.30 p.m., on Saturday, January 11. Particulars may be obtained from Flt. Lt. F. S. Wainscot, Electrical and Wireless School, Royal Air Force, Cranwell, Lincs.

HALF-YEARLY PROMOTIONS

The Air Ministry announces:—

The undermentioned promotions are made with effect from January 1, 1936:—

GENERAL DUTIES BRANCH

Air Vice-Marshals to be Air Marshals

Frederick William Bowhill, K.C.B., C.M.G., D.S.O.
Charles Stuart Burnett, K.C.B., C.B.E., D.S.O.

Air Commodores to be Air Vice-Marshals

Arthur Sheridan Barratt, C.M.G., M.C.
Ernest Leslie Gossage, D.S.O., M.C.
John Eustace Arthur Baldwin, D.S.O., O.B.E.
Richard Edmund Charles Peirse, D.S.O., A.F.C.

Group Captains to be Air Commodores

Paul Copeland Maltby, D.S.O., A.F.C. (Acting Air Commodore).

Douglas Claude Strathern Evill, D.S.C., A.F.C.
Trafford Leigh Leigh-Mallory, D.S.O.
Richard Hallam Peck, O.B.E.

Wing Commanders to be Group Captains

Reginald Stuart Maxwell, M.C., D.F.C., A.F.C.
Hugh Vivian Champion de Crespigny, M.C., D.F.C.
Charles Henry Elliott-Smith, A.F.C.
John Cannan Russell, D.S.O.
Anthony Rex Arnold, D.S.C., D.F.C.
Alexander Gray, M.C.
Ronald Graham, D.S.O., D.S.C., D.F.C.
Robert Dickinson Oxland, O.B.E.
Horace Percy Lale, D.S.O., D.F.C.
Reginald Lennox George Marix, D.S.O.
Edward James Poynter Burling, D.S.C., D.F.C., A.F.C.
Leslie Frederick Forbes, M.C.
Arthur Leslie Gregory, M.B.E., M.C.

Squadron Leaders to be Wing Commanders

Cyril Porri.
Frederic Gunning Stammers, O.B.E.
Harold Walter Evens.
Colin Spencer Richardson, M.B.E.
Ronald Scott Sugden, A.F.C.
Horace Ernest Philip Wigglesworth, D.S.C. (Acting Wing Commander).
Ernest John Cuckney, D.S.C.
Harold Jace Roach, A.F.C.
David Frederick Lucking.
Hedley Vicars Drew, O.B.E., A.F.C.
Ernest John Dennis Townesend.
Eric Bourne Coulter Betts, D.S.C., D.F.C.
Wilfred Reseigh Cox, M.C., A.F.C.
Charles Reginald Keary.
George Harold Boyce, A.F.C.
Hugh William Lumsden Saunders, M.C., D.F.C., M.M.
Leslie Norman Hollinghurst, O.B.E., D.F.C. (Acting Wing Commander).
Alban Spenser Ellerton, O.B.E.
Arthur Penrose Martyn Sanders.
George William Bentley, D.F.C.
Joseph Stewart Temple Fall, D.S.C., A.F.C.
Ryder Young.
Henry Sydney Scroggs.
Edward Fisher Turner, A.F.C.
Lewis George Le Blount Croke.
Peter Warburton, M.B.E.
Robert Parker Musgrave Whitham, O.B.E., M.C.
Philip Fletcher Fullard, D.S.O., M.C., A.F.C.
Howard Oakey Long, D.S.O.
Clarence Edward Williams Lockyer.
Rupert St. Aubyn Malleson, A.F.C. (Commander R.N.).

Flight Lieutenants to be Squadron Leaders

Anthony Cecil Boris Harrison, M.C.
John Douglas Stirling Denholm.
Gerald Gladstone Walker, M.C.
Kenneth Lenton Boswell.
Albert Edward Case.
John Christian Barraclough.
Campbell Alexander Hoy, M.C.
Hugh Nelson, M.B.E.
John Henry Forrest Burroughs (Lieutenant Commander, R.N.).
Alex Alderson Murray (Lieutenant Commander, R.N.).
Guy Willoughby (Lieutenant Commander, R.N.).
Llewelyn George Richardson (Lieutenant Commander, R.N.).

Flying Officers to be Flight Lieutenants

Gerald Donald Anderson (Lieutenant, R.N.).
Thomas Walter Townsend Blackwell (Lieutenant, R.N.).
Hugh Peter Bramwell (Lieutenant, R.N.).
Francis Elton Christopher Judd (Lieutenant, R.N.).
Antony Francis Hall (Lieutenant, R.N.).
Patrick George Osric Sydney-Turner (Lieutenant, R.N.).
William Hynd Norrie Martin (Lieutenant, R.M.).

STORES BRANCH

Squadron Leader to be Wing Commander

Edwin Maurice Cashmore.

ACCOUNTANT BRANCH

Squadron Leader to be Wing Commander

Thomas Coates Miller, M.C.

MEDICAL BRANCH

Air Commodore to be Air Vice-Marshal

Alfred William Iredell, M.R.C.S., L.R.C.P., K.H.P.

Wing Commanders to be Group Captains

Gerald Struan Marshall, O.B.E., M.R.C.S., L.R.C.P., D.P.H., D.T.M. & H., L.D.S.
Raymond William Ryan, M.B., B.S.

Squadron Leaders to be Wing Commanders

George Henry Hope Maxwell, M.B., Ch.B., D.P.H.
William Edward Barnes, M.R.C.S., L.R.C.P.
James Daly Leahy, M.C., M.B., B.Ch.
Edward Cyril Knowles Henry Foreman, M.R.C.S., L.R.C.P.
William John Greaves Walker, M.R.C.S., L.R.C.P.

ROYAL AIR FORCE GAZETTE

London Gazette, December 31, 1935

General Duties Branch

Group Capt. P. Babington, M.C., A.F.C., is appointed Director of Postings, Air Ministry, vice A.V.-M. R. P. Mills, C.B., M.C., A.F.C. (January 1, 1936); F/O. R. C. Richmond is granted a permanent commission in this rank (December 29); Acting P/O. on probation V. N. Clifton is confirmed in rank and graded as Pilot Officer (August 24); P/O. G. W. Golledge is promoted to the rank of Flying Officer (November 22); A.V.-M. R. P. Mills, C.B., M.C., A.F.C., is placed on the retired list at his own request (January 1, 1936); Sqn. Ldr. A. Rowan is placed on the retired list (January 1, 1936); Flt. Lt. J. W. Bell, D.S.M., is placed on the retired list at his own request (January 1, 1936).

The following are transferred to the Reserve, Class A, on the dates stated:—F/O. N. P. Samuels (December 29); F/O. D. L. Dustin (December 31); Flt. Lt. D. Dickson (January 1, 1936).

F/O. J. K. Quill is transferred to the Reserve, Class C (December 31).

The short service commissions of the following Acting Pilot Officers on probation are terminated on cessation of duty (December 28):—J. G. Brown, L. O. Brooks.

Medical Branch

Flt. Lt. L. Freeman, L.M.S.S.A., D.M.R.E., is promoted to the rank of Squadron Leader (January 1, 1936).

Dental Branch

F/O. W. V. A. Denney, L.D.S., is promoted to the rank of Flight Lieutenant (October 1).

Memoranda

841257 Cadet R. Brodie is granted an honorary commission as 2nd Lieutenant with effect from the date of his discharge. The permission granted to A. E. Walsh to retain the rank of 2nd Lieutenant, which was withdrawn on his enlistment into the Scots Guards, is restored on his discharge (January 9, 1931).

AUXILIARY AIR FORCE

General Duties Branch

No. 600 (CITY OF LONDON) (FIGHTER) SQUADRON.—P/O. H. Teesdale-Smith resigns his commission (November 1).

No. 601 (COUNTY OF LONDON) (FIGHTER) SQUADRON.—P/O P. R. Foley is promoted to the rank of Flying Officer (November 18).

No. 602 (CITY OF GLASGOW) (BOMBER) SQUADRON.—P/O. M. Robinson is promoted to the rank of Flying Officer (November 8).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Wing Commanders.—F. O. Soden, D.F.C., to No. 7 (B) Squadron, Worthy Down; to command, vice Wing Cdr. A. Gray, M.C., 19.12.35. G. B. A. Baker, M.C., to Headquarters, Fighting Area, Uxbridge; for Air Staff duties vice Wing Cdr. H. A. Whistler, D.S.O., D.F.C., 22.12.35. The Hon. R. A. Cochrane, A.F.C., to Headquarters, Inland Area, Stanmore; for Air Staff duties vice Group Capt. H. V. Champion de Crespigny, M.C., D.F.C., 22.12.35. A. S. G. Lee, M.C., to R.A.F. Station, Hornchurch; to command, 22.12.35.

Flight Lieutenants.—I. E. Brodie, to No. 111 (F) Squadron, Northolt, 22.11.35. J. E. M. MacCallum, to No. 15 (B) Squadron, Abingdon, 17.12.35.

Flying Officers.—P. W. Stansfeld, to No. 2 (Army Co-operation) Squadron, Manston, 21.12.35. T. K. Lacey, to No. 13 (Army Co-operation) Squadron, Old Sarum, 21.12.35. G. J. I. Clennell, to No. 15 (B) Squadron, Abingdon, 17.12.35. P. C. Lawrence, to R.A.F. Station, Bircham Newton, 13.12.35.

Pilot Officers.—J. E. Townsend, to No. 48 (G.R.) Squadron, Manston, 16.12.35. C. F. Herington, T. S. Jameson, M. M. Kane, to No. 15 (B) Squadron, Abingdon, 17.12.35. A. G. G. Baird, J. R. Maling, F. L. Newall, to No. 40 (B) Squadron, Abingdon, 17.12.35.

Stores Branch

Squadron Leader.—W. St. J. Littlewood, to R.A.F. Station, Manston; for Stores duties, vice Sqn. Ldr. E. Meynell, D.C.M., 21.12.35.

Flight Lieutenant.—D. W. Dean, to No. 99 (B) Squadron, Mildenhall, 18.12.35. C. Thripp, to Administrative Wing, Cranwell, 21.12.35.

Medical Branch

Wing Commander.—J. Rothwell, to R.A.F. Station, Manston; for duty as Medical Officer, 24.12.35.

Correspondence

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for publication in these columns.

TWO-SPAR CANTILEVER WINGS

[3104] I was a good deal interested in Mr. Walker's article on two-spar cantilever wings in *The Aircraft Engineer* of December 26.

I believe he has had difficulty in getting people to believe that the flexural bending moment on the front spar is

$$M_F = \frac{M\,I_F}{I_F + I_R} = RM.$$

Actually, the formula for the mysterious "flexural line" is got by double differentiation of this equation.

To satisfy myself completely on this point I took an actual example and compared the values of M_F found from the above with those found by double integration of the spar loading curve due to the load along the flexural line. The example chosen was a severe test, as the flexural line deviated widely from the "R" line.

The results were astonishing. In the inboard half of the wing the greatest discrepancy was ¼ per cent. Near the tip, where the quantities involved are smaller, there was more difference but not more than 3 per cent. This is, perhaps, a miraculous concatenation of errors, or else a startling tribute to my ability to establish friendly relations with a planimeter. On the other hand, we may hope that it is a verification of what is really almost obvious and a check on the accuracy with which the flexural line was calculated.

Portsmouth. J. D. BURTON, B.Sc.

A TWO-STROKE AERO ENGINE

[3105] On reading the article entitled "An Interesting Two-Stroke Engine" appearing in your issue of December 26, I feel that the engine referred to might be criticised on the grounds of possible overheating, especially in view of the fact that the engine is supercharged, and being a two-stroke has double the number of incandescent flame contacts, at a higher temperature, than a four-stroke. One might easily wonder how this air-cooled engine dealt with the high heat flow without overheating.

The article states that "pure air is drawn into the transfer belt and pipe. This serves, etc." Air is also drawn through the tangential transfer ports, causing the air to come in contact with the cylinder walls, swirling and absorbing heat from the walls, underside of piston crown and piston rod. In other words, the working cylinder is cooled internally as well as externally, and the head is further cooled by the oil emulsion which lubricates the exhaust valve actuating gear.

During the 100-hour test referred to in the article, no part of the engine suffered from overheating, and at all times it was possible to place one's hands on the exhaust valve operating gear cover without the least discomfort. E. W. LAMB.

Ruislip, Middlesex.

AERODROMES OUT OF PETROL TAX

[3106] The eightpence per gallon tax on petrol is excellent policy because it encourages economy in the use of an imported article and also provides a very useful fund out of which the British Government can subsidise the provision of certain things which would be extremely difficult to obtain by any other method.

At the present moment private flying is being held up because there are too few aerodromes, and the majority are too far from the towns they are intended to serve to be of real practical use.

The type of aeroplane which the average individual would use for flying about Britain and the surrounding countries for business or pleasure need not have a very high top speed, and must have a short take-off, landing run, and slow stalling speed, so that landings can be made without serious damage in case of engine failure, and to enable pilots to feel their way carefully through some of the thick weather which we are used to in this country.

For the foregoing type of aeroplane only small aerodromes are necessary—a piece of land measuring five hundred yards by five hundred yards each way is ample, provided it is reasonably level and the approach and take-off are not obstructed by large surrounding obstacles.

It is recognised that there must be a certain number of larger aerodromes for the faster, long-distance machines, but, after all, the most important thing is that every town should have an aerodrome as close to it as possible, even if it is only a small one to start with, so that a stagnant situation can be relieved.

As a rule pilots do not want to fly from country club house to country club house, but from their homes to the homes of their friends, or from their place of business to the place of business of their customers or clients, as the case may be. A railway station is not regarded as a club.

Motorists demand that the taxes which they pay on their cars and on petrol should be spent on the roads, therefore it is equally just that the taxes paid by the "aeroists" (to coin a new word) should be spent upon aerodromes.

Aerodromes also require road approaches, and the road system is to a certain extent dependent upon the positions of aerodromes; also, the use of the air will relieve road traffic if the aerodromes are properly situated. "Aeroists" also use cars to travel to and from aerodromes; therefore it would be perfectly just to take money from the present Road Fund in order to provide every town with correctly situated aerodromes before the road system is further developed.

In the past certain aeroplane clubs have been subsidised, others have not, but have carried on, nevertheless. The subsidies were only necessary to cover the extra expense caused by the innumerable Air Ministry regulations; now many of these regulations have been removed or eased by the Air Ministry's action in accepting the greater part of the Gorell Report.

It is also time that subsidised clubs stood more on their own feet; everyone would get a sort of indirect subsidy through making use of aerodromes provided out of subsidy; so the present club subsidies might just as well be withdrawn and be thrown into the pool for the provision of aerodromes.

It is to be hoped that our new Government and the Air Ministry will see their way to take prompt action in this matter. ERIK T. W. ADDYMAN.

Harrogate.

AUTOGIRO EFFICIENCY

[3107] When your correspondent Mr. Buchanan refers to the difference between the top speed of an Autogiro and a fixed wing machine as 2 or 3 m.p.h. he not only becomes unreasonable but unfair. Instead of writing further I should like to refer him to any air-line operator who makes a business of flying, or, if they are too busy, glider designers. The latter, as a class, have shown power-craft builders how to build efficient machines for the last ten years. Nearly all the newest machines of to-day bear a strong resemblance to what sailplanes have been like for long enough, and when the designers turn to revolving wings then Mr. Buchanan can rest assured that as a passenger carrying proposition every plane will have revolving wings.

I am afraid the above argument will not interest many readers but I think the following may, as there has been a great deal of interest shown on the question of low-wing monoplanes and why they are so common.

As I have never read of any direct comparison published in this country, the following, given in an American magazine, should throw more light on the subject. Mr. Long built a standard fuselage with a certain engine and propeller of no particular interest—about 35 h.p. I believe. He built on to this fuselage four different wings of the same section and size: a high-wing parasol, a mid-wing strut-braced, a low-wing strut-braced, and a low-wing wire-braced. In brief, he strongly condemns the use of struts on the top of wings, as they upset the airflow. Comparing types, he finds the low-wing wire-braced the best, with a 25 m.p.h. landing speed against 35 of the parasol, a take-off run about half the length and slightly better top speed and climb. He puts down the better characteristics to the cushioning effect of the wave created under the lower wing. This is well known, but I have never seen figures before.

I only hope Mr. Long goes forward with his tests, and should like to congratulate him on his efforts. P. PRIEST.

Huddersfield.

INSTRUMENT FLYING "AB INITIO"

Can One Who Has Never Flown be Taught by Blind-flying Methods More Efficiently Than by the Accepted Means? An Interesting Danish Experiment

By S. A. DALBRO, Chief Instructor, Royal Danish Naval Air Service School

(*Flight* photograph)

IN the issue of *Flight* of October 17, 1935, Mr. H. A. Taylor, in an article on instrument flying, wrote as follows: "Instrument-flying training is still very largely a matter of psychology, since the pilot must learn to ignore all his sensory impressions, and the greater his experience the greater his difficulty in ignoring them. It would be interesting to know whether a person who had never flown at all could be taught to fly by instruments in a shorter period than any normal pilot; such a person would at least find no need to be a kind of Jekyll and Hyde when under the hood."

In the following notes an attempt is made to throw some light upon this very interesting subject by giving the results and experiences gained at the flying school of the Royal Danish Naval Air Service, where the very method of training which my fellow-contributor instances has been employed for several years, while the pupils are here being taught instrument flying before horizon flying.

As far as I know, a uniform system is followed at all other places: The pupil first receives his basic training in horizon flying, which is carried so far that he can pass all the various tests for his certificate, and so that by the end of his training he has acquired a general and good all-round experience. After that he receives only a *supplementary training* in instrument flying. The method followed in this training does not involve any great problems. The same approved system is adopted by all well-established flying schools. Mainly using the same kind of instruments, the pupils are taught to fly straight, to climb and glide, to steer and turn by compass (both banking turns and flat "compass turns" or "instrument-flying turns"), to fly on a triangular course, and to get into a spin and to recover from it again.

The Importance of Blind Flying

This procedure has been developed quite naturally. Instrument flying is of rather recent date, and has for this reason been added to the ordinary flying training as a supplement which, though admittedly very important, is nevertheless considered secondary to the basic flying training.

Yet instrument flying is now being so widely employed that it is obvious that no pilot leaving a flying school without having mastered it can be considered fully trained. The question is, then, whether the common method of training, which up to now has been used at most schools, is the best possible.

The point of view that instrument-flying training is only a supplementary affair can no longer hold good. Training in instrument flying is just as important as training in horizon flying, and it is only logic that the system to be aimed at should be the one which will make the pilot proficient in both departments in the shortest and safest way.

It is an acknowledged fact everywhere that pilots trained in horizon flying have difficulty in becoming thoroughly conversant with instrument flying. They have to overcome or ignore their "perceptions" of the flight attitude of the aircraft which they have acquired during the training in horizon flying. And while any system of training should present as few difficulties as possible to the pupils, the thought arises: Why not try to remove this great disadvantage of "perceptions" during instrument-flying training by teaching this *before* horizon flying? And, furthermore, is it possible to benefit in this way without losing something else?

One thing is clear—that if the problem is considered solely from the aspect of instrument flying, there can be no question that there will be no supplementary difficulties, as instrument flying fundamentally has nothing to do with flying, but only with the proper co-ordination of muscular reactions correlated to certain instrument readings.

This idea has, as mentioned, been carried out in practice at the flying school of the Royal Danish Naval Air Service. Before the experiences which have been gained are presented, however, an analysis of the problems of horizon flying and instrument flying may be expedient and illuminating.

The Two Methods

Horizon flying is based upon a series of sensory impressions which first of all require outside sighting points, which again means visibility, in order to make possible correct and safe flying. These sensory impressions are translated more or less subconsciously to reactions on the flying controls. The visual impressions are by far the most important, as the pilot is able to estimate his machine's attitude in the air only when he can see some fixed points outside it. The sense of equilibrium may, of course, help him to ascertain a momentary attitude, while his hearing may contribute in judging whether the longitudinal attitude is correct or not. Control of attitude of the aircraft by means of the instruments should be reduced to the least possible so that the reciprocal action of outside observations and sensory perceptions after a while becomes absolutely subconscious and instinctive.

Instrument flying is based upon a series of visual impressions of the reactions of the flying instruments. That obviousness with which the outside observations of horizon flying are translated to a perception of the momentary attitude is entirely lacking here, and, in addition, it now takes a lot of concentration and effort to follow the instruments and to *deduce by logic*—not subconsciously or instinctively—the real attitude of the aircraft.

The more a pilot is bound by "perceptions" due to a previous horizon-flying training, the more the necessary effort is increased. It is a well-known fact that every

normal pilot carries with him to instrument flying the perception of flight attitude which he acquired during horizon flying. These perceptions are directly related to outside observations, and when such are lacking the perceptions are deprived of their safe and only foundation. An absolute faith in the instruments is now of fundamental importance, and only when this profound confidence has been acquired can the pilot completely disregard any form of "perception."

The experience gained at the Danish Naval Flying School has confirmed that instrument flying, when taught to a novice, is grasped better, and that within an equal number of hours he obtains greater accuracy and better routine than a pupil who has been trained first in horizon flying.

Results have shown that, once a pupil is fully proficient in instrument flying, further training in horizon flying does not present any difficulties, while the necessary recurrent instrument-flying training is brought down to an absolute minimum.

It thus seems that the difficulties attached to the system of tuition are decidedly less than those attached to the old system. They amount chiefly to a tendency of the pupil to "hang on" to the instruments instead of using the natural horizon. This, however, is easy to correct. When instrument flying is taught the natural horizon is "removed" by closing the hood. When horizon flying is taught (after instrument flying) the instruments are in turn "removed" by covering up the dials of all the flying instruments with paper. They are uncovered again when the instructor feels confident that the pupil has fully grasped horizon flying—which is just before his first solo flight. During further training it is very easy for the instructor, at refresher dual control, to find out whether the pupil flies "naturally" or whether he is inclined to "hang on" to the instruments.

The Routine

Every year when a new class starts in the R.D.N. Air Service School the pupils are first taken aloft a certain number of trips merely as passengers, and may in this way get up to three hours in the air, during which time they get a first-hand and agreeable impression of flying in general. After this short period they are given preliminary dual in both horizon flying and instrument flying—about five hours of each, totalling up about ten hours' instruction.

The object of this instruction is not to start training but to give the instructor an opportunity as early as possible to weed out those pupils who are not fitted for further military flying training or who are not considered able to complete the training with satisfactory results. After this period the accepted pupils continue half a year with theoretical and physical training, but without doing any flying at all. In this theoretical training it is an advantage, of course, that the pupils have previously been made acquainted with the aircraft, its flying controls and its instruments.

When the theoretical training is completed the actual flying training starts right away with instrument flying under the hood. The type of training aircraft used is the Avro Tutor, and the instruments include a Reid and Sigrist bank and turn indicator and a pitch indicator. Only when the pupils have acquired good routine and can complete with accuracy a long triangular course (up to one hour's duration) in bumpy weather, and when they with perfect certainty can take the aircraft out of a spin—only then is the hood opened up again. This period takes from twelve to fifteen hours of instruction. Hereafter the training is continued with horizon flying which from time to time is supplemented by recurrent instrument flying, either under the hood or during actual cloud flying.

Seaplane Training

When the training on the Tutor terminates and the pupils have completed all the various tests for the certificate, they are transferred to seaplanes, on which they are trained until they can repeat all the previous certificate tests with the exception of aerobatics and spins, but with the inclusion of water manœuvring. By this time they have obtained an average of 125 hours in the air, and of these about twenty-five are instrument flying.

Certain objections may be raised. It may be asked whether a pilot trained first in instrument flying can ever be absolutely superior in horizon flying and come to feel as confident and unified with his aircraft as was once considered necessary. Will this "instrument pilot" not continually "hang on" to his instruments and thus feel restrained in his flying, which should ultimately reach the point of being completely intuitive or instinctive? Nothing, however, seems to sustain this objection. The experiences show that pilots trained in this way are in every respect as capable as pilots trained by the old system. They do not feel any restraints or limitations, but seem equally at ease whether they fly by the natural horizon or suddenly switch over to use the instruments.

At the Danish Naval Air Service School the system of training which has just been expounded is going to be continued in the future. Present results, all things considered, clearly indicate that it presents the greatest advantages together with the least inconvenience, and that it brings the desired results in the shortest possible way.

Forthcoming Events

Club Secretaries and others are invited to send particulars of important fixtures for inclusion in the list.

Jan. 9. R.Ae.S. Students' Section Discussion: "Stressed-skin Construction," 7 p.m., R.Ae.S. Library, 7, Albemarle Street, London, W.1.

Jan. 14. Irish Aero Club: Annual Dance, Gresham Hotel, Dublin.

Jan. 16. R.Ae.S. (Coventry Section) Lecture: "Development in Centrifugally Cast Piston Rings for Modern Aero Engines," by Mr. P. R. Twigger, 8 p.m., Armstrong Siddeley Canteen.

Jan. 20. R.Ae.S. Lecture: "The Theory of Alloy Structures," by Prof. W. L. Bragg. Institution of Electrical Engineers, 6.30 p.m.

Jan. 22. Royal United Service Institution Lecture: "The Expansion of the Royal Air Force," by Air Marshal Sir C. L. N. Newall, at 3 p.m.

Jan. 22. Civil Aviation Service Corps, No. 1 (London) Sqn. Dance the Horns, Kennington, 8.30 p.m.

Jan. 28. R.Ae.S. Students' Section Discussion: "Sailplanes," 7 p.m., R.Ae.S. Library, 7, Albemarle Street, London, W.1.

Jan. 30 and 31. Aerodrome Owners' Association: Annual Conference and Aerodrome Equipment Exhibition British Industries House, Marble Arch, London.

Feb. 3. R.Ae.S. Lecture: "Airscrew Development" by Dr. H. C. Watts. Institution of Electrical Engineers, 6.30 p.m.

Feb. 12. Yorkshire Aviation Services Country Club: Dinner and Dance, 8 p.m., Grand Hotel, Harrogate.

Feb. 17. R.Ae.S. Lecture: "The Boundary Layer," by Prof. L. Bairstow. Institution of Electrical Engineers, 6.30 p.m.

Feb. 20. R.Ae.S. (Coventry Section) Lecture: "Variable-pitch Propeller," by Mr. T. E. Beacham, 8 p.m., Armstrong Siddeley Canteen.

Feb. 28. Bristol and Wessex Aeroplane Club: Annual Aviation Ball.

Mar. 10. Royal United Service Institution Lecture: "The Development of Civil Aviation" by Lt. Col. F. C. Shelmerdine, at 3 p.m.

Mar. 19. R.Ae.S. (Coventry Section) Lecture: "Type-Testing an Aircraft" by Flt. Lt. Bulman, 8 p.m., Armstrong Siddeley Canteen.

Mar. 23. R.Ae.S. Lecture: "Welding," by R. H. Dobson Institution of Electrical Engineers, 6.30 p.m.

Mar. 26-29. Yorkshire Gliding Club: Members' Meeting.

April 16. R.Ae.S. (Coventry Section) Lecture: "Aircraft Instruments," by Mr. J. E. Chorlton, 8 p.m., Armstrong Siddeley Canteen.

April 20. "New Light on Strength of Materials Afforded by Modern Physics," by Dr. H. J. Gough. Institution of Electrical Engineers, 6.30 p.m.

May 15-18. Yorkshire Gliding Club: Open Meeting and Competitions.

May 15.-June 1. Stockholm Aero Show.

June 6. R.A.F. Flying Club: Annual Display.

June 20. Brooklands Flying Club: "At Home."

August 1-2. Yorkshire Gliding Club: Open Meeting.

August 15-30. Yorkshire Gliding Club: Open Meeting and Competitions.

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This idea has, as mentioned, been carried out in practice at the flying school of the Royal Danish Naval Air Service. Before the experiences which have been gained are presented, however, an analysis of the problems of horizon flying and instrument flying may be expedient and illuminating.

The Two Methods

Horizon flying is based upon a series of sensory impressions which first of all require outside sighting points, which again means visibility, in order to make possible correct and safe flying. These sensory impressions are translated more or less subconsciously to reactions on the flying controls. The visual impressions are by far the most important, as the pilot is able to estimate his machine's attitude in the air only when he can see some fixed points outside it. The sense of equilibrium may, of course, help him to ascertain a momentary attitude, while his hearing may contribute in judging whether the longitudinal attitude is correct or not. Control of attitude of the aircraft by means of the instruments should be reduced to the least possible so that the reciprocal action of outside observations and sensory perceptions after a while becomes absolutely subconscious and instinctive.

Instrument flying is based upon a series of visual impressions of the reactions of the flying instruments. That obviousness with which the outside observations of horizon flying are translated to a perception of the momentary attitude is entirely lacking here, and, in addition, it now takes a lot of concentration and effort to follow the instruments and to *deduce by logic*—not subconsciously or instinctively—the real attitude of the aircraft.

The more a pilot is bound by "perceptions" due to a previous horizon-flying training, the more the necessary effort is increased. It is a well-known fact that every

normal pilot carries with him to instrument flying the perception of flight attitude which he acquired during horizon flying. These perceptions are directly related to outside observations, and when such are lacking the perceptions are deprived of their safe and only foundation. An absolute faith in the instruments is now of fundamental importance, and only when this profound confidence has been acquired can the pilot completely disregard any form of "perception."

The experience gained at the Danish Naval Flying School has confirmed that instrument flying, when taught to a novice, is grasped better, and that within an equal number of hours he obtains greater accuracy and better routine than a pupil who has been trained first in horizon flying.

Results have shown that, once a pupil is fully proficient in instrument flying, further training in horizon flying does not present any difficulties, while the necessary recurrent instrument-flying training is brought down to an absolute minimum.

It thus seems that the difficulties attached to the system of tuition are decidedly less than those attached to the old system. They amount chiefly to a tendency of the pupil to "hang on" to the instruments instead of using the natural horizon. This, however, is easy to correct. When instrument flying is taught the natural horizon is "removed" by closing the hood. When horizon flying is taught (after instrument flying) the instruments are in turn "removed" by covering up the dials of all the flying instruments with paper. They are uncovered again when the instructor feels confident that the pupil has fully grasped horizon flying—which is just before his first solo flight. During further training it is very easy for the instructor, at refresher dual control, to find out whether the pupil flies "naturally" or whether he is inclined to "hang on" to the instruments.

The Routine

Every year when a new class starts in the R.D.N. Air Service School the pupils are first taken aloft a certain number of trips merely as passengers, and may in this way get up to three hours in the air, during which time they get a first-hand and agreeable impression of flying in general. After this short period they are given preliminary dual in both horizon flying and instrument flying—about five hours of each, totalling up about ten hours' instruction.

The object of this instruction is not to start training but to give the instructor an opportunity as early as possible to weed out those pupils who are not fitted for further military flying training or who are not considered able to complete the training with satisfactory results. After this period the accepted pupils continue half a year with theoretical and physical training, but without doing any flying at all. In this theoretical training it is an advantage, of course, that the pupils have previously been made acquainted with the aircraft, its flying controls and its instruments.

When the theoretical training is completed the actual flying training starts right away with instrument flying under the hood. The type of training aircraft used is the Avro Tutor, and the instruments include a Reid and Sigrist bank and turn indicator and a pitch indicator. Only when the pupils have acquired good routine and can complete with accuracy a long triangular course (up to one hour's duration) in bumpy weather, and when they with perfect certainty can take the aircraft out of a spin—only then is the hood opened up again. This period takes from twelve to fifteen hours of instruction. Hereafter the training is continued with horizon flying which from time to time is supplemented by recurrent instrument flying, either under the hood or during actual cloud flying.

Seaplane Training

When the training on the Tutor terminates and the pupils have completed all the various tests for the certificate, they are transferred to seaplanes, on which they are trained until they can repeat all the previous certificate tests with the exception of aerobatics and spins, but with the inclusion of water manœuvring. By this time they have obtained an average of 125 hours in the air, and of these about twenty-five are instrument flying.

Certain objections may be raised. It may be asked whether a pilot trained first in instrument flying can ever be absolutely superior in horizon flying and come to feel as confident and unified with his aircraft as was once considered necessary. Will this "instrument pilot" not continually "hang on" to his instruments and thus feel restrained in his flying, which should ultimately reach the point of being completely intuitive or instinctive? Nothing, however, seems to sustain this objection. The experiences show that pilots trained in this way are in every respect as capable as pilots trained by the old system. They do not feel any restraints or limitations, but seem equally at ease whether they fly by the natural horizon or suddenly switch over to use the instruments.

At the Danish Naval Air Service School the system of training which has just been expounded is going to be continued in the future. Present results, all things considered, clearly indicate that it presents the greatest advantages together with the least inconvenience, and that it brings the desired results in the shortest possible way.

Forthcoming Events

Club Secretaries and others are invited to send particulars of important fixtures for inclusion in the list.

Jan. 9. R.Ae.S. Students' Section Discussion: "Stressed-skin Construction," 7 p.m., R.Ae.S. Library, 7, Albemarle Street, London, W.1.

Jan. 14. Irish Aero Club: Annual Dance, Gresham Hotel, Dublin.

Jan. 16. R.Ae.S. (Coventry Section) Lecture: "Development in Centrifugally Cast Piston Rings for Modern Aero Engines," by Mr. P. R. Twigger, 8 p.m., Armstrong Siddeley Canteen.

Jan. 20. R.Ae.S. Lecture: "The Theory of Alloy Structures," by Prof. W. L. Bragg. Institution of Electrical Engineers, 6.30 p.m.

Jan. 22. Royal United Service Institution Lecture: "The Expansion of the Royal Air Force," by Air Marshal Sir C. L. N. Newall, at 3 p.m.

Jan. 22. Civil Aviation Service Corps, No. 1 (London) Sqn. Dance, the Horns, Kennington, 8.30 p.m.

Jan. 28. R.Ae.S. Students' Section Discussion: "Sailplanes," 7 p.m., R.Ae.S. Library, 7, Albemarle Street, London, W.1.

Jan. 30 and 31. Aerodrome Owners' Association: Annual Conference and Aerodrome Equipment Exhibition, British Industries House, Marble Arch, London.

Feb. 3. R.Ae.S. Lecture: "Airscrew Development" by Dr. H. C. Watts. Institution of Electrical Engineers, 6.30 p.m.

Feb. 12. Yorkshire Aviation Services Country Club: Dinner and Dance, 8 p.m., Grand Hotel, Harrogate.

Feb. 17. R.Ae.S. Lecture: "The Boundary Layer," by Prof. L. Bairstow. Institution of Electrical Engineers, 6.30 p.m.

Feb. 20. R.Ae.S. (Coventry Section) Lecture: "Variable-pitch Propeller," by Mr. T. E. Beacham, 8 p.m., Armstrong Siddeley Canteen.

Feb. 28. Bristol and Wessex Aeroplane Club: Annual Aviation Ball.

Mar. 10. Royal United Service Institution Lecture: "The Development of Civil Aviation" by Lt. Col. F. C. Shelmerdine, at 3 p.m.

Mar. 19. R.Ae.S. (Coventry Section) Lecture: "Type-Testing an Aircraft" by Flt. Lt. Bulman, 8 p.m., Armstrong Siddeley Canteen.

Mar. 23. R.Ae.S. Lecture: "Welding," by R. H. Dobson. Institution of Electrical Engineers, 6.30 p.m.

Mar. 26-29. Yorkshire Gliding Club: Members' Meeting.

April 16. R.Ae.S. (Coventry Section) Lecture: "Aircraft Instruments," by Mr. J. E. Chorlton, 8 p.m., Armstrong Siddeley Canteen.

April 20. "New Light on Strength of Materials Afforded by Modern Physics," by Dr. H. J. Gough. Institution of Electrical Engineers, 6.30 p.m.

May 15-18. Yorkshire Gliding Club: Open Meeting and Competitions.

May 15.-June 1. Stockholm Aero Show.

June 6. R.A.F. Flying Club: Annual Display.

June 20. Brooklands Flying Club: "At Home."

August 1-2. Yorkshire Gliding Club: Open Meeting.

August 15-30. Yorkshire Gliding Club: Open Meeting and Competitions.

THE INDUSTRY

From Australia

SOME interesting information about that famous Australian air line, the MacRobertson-Miller Perth-Daly Waters mail service, is contained in a descriptive brochure issued by the Vacuum Oil Co., Pty., Ltd., of Melbourne.

Tecalemit Children's Party

THE annual party and entertainment given to the children of Tecalemit employees by Mrs. R. A. Chalmers, wife of the managing director, took place in the Works Canteen on Saturday, December 28.

Instrument Issue

AN issue of 380,000 5s. ordinary shares was due to be made this week on behalf of Aeronautical and General Instruments, Ltd. The company has been formed to acquire the instrument manufacturing department of Radio Instruments, Ltd., of Croydon, approved manufacturers to the Air Ministry and other Government departments.

Undercarriage Expansion

THE Turner Motor Manufacturing Co., Ltd., of Wulfruna Works, Wolverhampton, has acquired No. 2 Body Shop of the Sunbeam Works and adjoining land, a total of 100,000 sq. ft. It is understood that this is to cope with greatly increased orders for the Turner undercarriage leg.

Reducing Resonance

A TREATMENT for metal surfaces has been introduced by Cellon, Ltd., whereby resonance is considerably reduced. It is produced in two forms, one for application to the inside of metal panels, and the other, which lends itself to artistic treatment, for external use. The surface is of "suede" appearance.

Battery Durability

A REMARKABLE tribute to the durability of Exide aircraft batteries is furnished by the news that they were employed in the American stratosphere balloon *Explorer II*, and that in order to secure a gentle descent they, in company with other apparatus, were dropped overboard attached to parachutes. It is stated that after a descent of ten miles they landed quite undamaged, and with even the electrolyte unspilled.

Designated by D. Lewis Ltd., of 124, Great Portland Street, London, an all-Zipp combination suit, this impressive flying suit has an exterior shell of superfine gabardine with an interlining of oil skin, and a further lining of heavy camel hair fleece. There are two large shin pockets, side pockets closed with Zipps, and two Zipp map pockets. The ankles and cuffs are also Zipp-fastened. There is, in addition, a Zipp fastener opening for the length of the body which, when closed, brings the high collar right up to the nose. The price is £5 17s. 6d.

SPANISH-BUILT: Some of the Spanish Air Force Vickers Vildebeest torpedo-bombers under construction at the Getafe, Madrid, works of Construcciones Aeronauticas S.A., who are building them under licence from Vickers (Aviation) Ltd. Twenty-six have recently been completed, with wheel undercarriages, while conversion sets to enable the machines to be used as twin-float seaplanes have also been produced by the C.A.S.A. Hispano Suiza engines are fitted. It is stated that the naval authorities, in particular, are extremely pleased with the Vildebeests.

This Year's Fixtures

AN extremely useful calendar of social, sporting and other events is that issued annually by the Travel and Industrial Development Association of Great Britain and Ireland. The 1936 edition recently appeared and is obtainable from the Association at Kinnaird House, 1, Pall Mall East, London, S.W.1.

NEW COMPANIES

In the notes below, for reasons of space, the "objects" of new companies are usually somewhat abbreviated.

MOTOR & AVIATION INSURANCE BROKERS LTD. (307,766) Private company. Registered December 4. Capital £300 in £1 shares. Objects: to carry on the business of insurance brokers and agents in respect of all classes of insurance. The directors are: John A. Gilmour (chairman and permanent director), Mrs Alice F. Gilmour, 28, Queen Elizabeth's Walk, N.16. Solicitor: Archibald C. Wood, 166, Streatham Hill, S.W.2.

MOSS BROTHERS, AIRCRAFT, LTD. Was registered as a private company on January 1, with a nominal capital of £5,500 in 10,000 founders' shares of 1s. and 10,000 ordinary shares of 10s. each. The objects are to carry on the business of designers, mfrs., and repairers of aircraft of all kinds. The directors are: Wm. H. Moss, 45, Ashfield Road, Chorley, Lancs; Geoffrey P. Moss, Richard A. S. Moss and Brian E. Moss; Ronald L. Moss, 45, Ashfield Road, Chorley, Lancs.

AERONAUTICAL AND GENERAL INSTRUMENTS LTD. was registered as a public company on January 3, with a nominal capital of £150,000 in 5s. shares. The objects are to acquire the goodwill, works, designs, and all other assets (except as mentioned in an agreement with Aero Syndicate Ltd.) of the business of makers of instruments (other than wireless receiving sets and parts for home use) carried on by Radio Instruments Ltd., of Purley Way, Croydon, and to carry on the business of instrument makers, etc. The following have consented to be directors: Sir Louis R. Vaughan, William McClelland, Latham V. S. Blacker, Joseph Joseph.

AERONAUTICAL PATENT SPECIFICATIONS

(The numbers in brackets are those under which the Specifications will be printed and abridged, etc.).

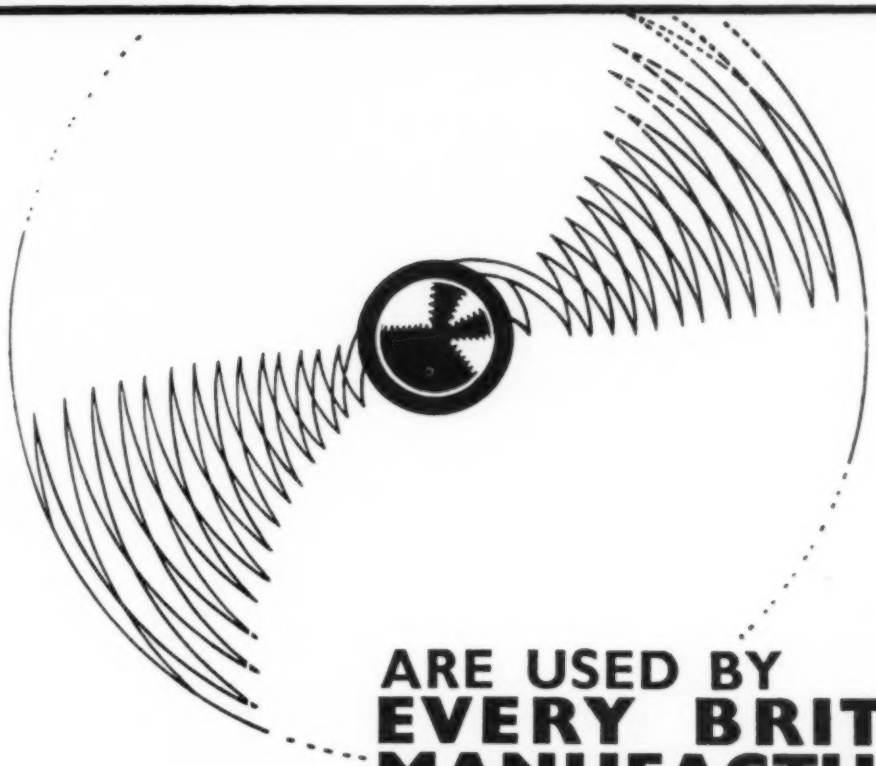
Published January 2, 1936.

10016. BARKER, G. G. (Bendix Aviation Corporation): Method of and means for preventing the accumulation of ice on aircraft (439,284).
13000. HOLLER, H. P.: Aircraft (439,240).
17451. PORTER, J. R.: Helicopter flying machines (439,298).
17484. DOWNING, A. E.: Aircraft (439,365).

Published, January 9, 1936.

10870. GRAY, A., AND GRAY, E. R. (Legal representatives of GRAY, J. G., deceased): Gyroscopic apparatus (439,630).
16861. LEDUC, R.: Jet propulsion apparatus for aircraft, projectiles, and turbine apparatus (439,805).
17880. BACK, W. E.: Toy aeroplane gliders (439,826).
19028. PETTERS, LTD., AND DAVENPORT, A.: Windshield devices for cockpits of aircraft or for equivalent spaces in other vehicles (439,645).
28602. AKT.-GES. C. P. GOERZ OPTISCHE ANSTALT.: Apparatus for automatically indicating the moment of launching a missile from an aircraft (439,656).
29098. BEVAN, R. H. L., AND CRAMPTON, C.: Direction-finding apparatus for use in wireless telegraphy (439,714).
33578. MESSERSCHMITT, W.: Controlling arrangements for aeroplanes (439,592).
951. SZAL, J. (trading as MOTOLUX): Synchronising devices for machine guns on aircraft (439,726).
4505. CURRAN, E.: Boundary beacon light for airports (439,730).
7592. PRECISION MODERNE: Aircraft gun-mountings and the like (439,733).
11400. FAIREY AVIATION CO., LTD., HALL, G. W., AND GREAVES, F.: Induction systems of internal-combustion engines (439,779).

WOODEN AIRSCREWS



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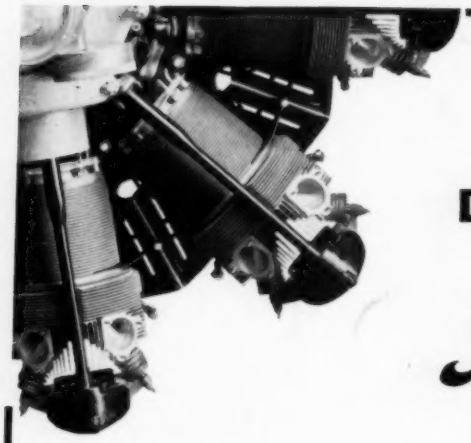

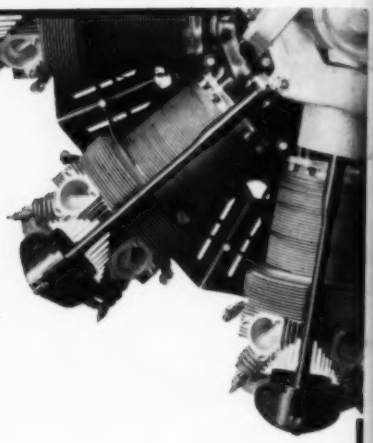

THE DURABILITY OF "Bristol" ENGINES

A Pegasus I.M. engine despatched in 1932 was recently returned for overhaul after 500 hours running. When tested it showed a drop in H.P. of only ONE per cent.

Official Rating.

B.H.P. at Rated Altitude. (4,500 ft.)	B.H.P. at Rated Boost. (Zero)	B.H.P. at Max. Boost. (+ 1 lb.)
565/590	520/540	565/590

Powers before despatch.

583	542	586

Powers after 500 hours.

575	536	580

When the engine was eventually stripped, nothing needed renewing except a few rocker buttons, valve springs, piston rings and gaskets.

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